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Journal Topics

Smart Home Environments (SHE) are emerging rapidly as an exciting new paradigm including ubiquitous, grid, and peer-to-peer computing to provide computing and communication services anytime and anywhere. But in order to realize their advantages, it requires the security services and applications to be suitable for SHE.

The Journal invites new and original submissions addressing theoretical and practical topics in information technology and intelligent computing fields including (but not limited to these topics):

SH Applications:

- Smart home (Building) applications and services
- Smart home network middleware and protocols
- Commercial and industrial application for SH
- Context awareness model for smart home services
- Wireless sensor networks (WSN) / RFID application for SH
- Semantic Technologies for SH
- Semantic Knowledge Management and Services in SH

SH Security:

- Multimedia Security and Services in SH
- Smart home security issues and model
- Access control and privacy protection in SH
- Forensics and Security Policy in SH
- WSN / RFID Security in SH
- Security Protocol for smart home service

SH Embedded Hardware and Software:

- Embedded Hardware Support for SH
- Embedded Software for SH
- Embedded System Architecture for SH
- Real-time OS for SH
- Smart and Personal Devices for SH
- Power-Aware Computing for SH
- Middleware for SH
- Specification, Validation and Verification of Embedded Software

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Foreword and Editorial

International Journal of Smart Home

We are very happy to publish this issue of an International Journal of Smart Home by Science and Engineering Research Support soCiety.

This issue contains 31 articles. Achieving such a high quality of papers would have been impossible without the huge work that was undertaken by the Editorial Board members and External Reviewers. We take this opportunity to thank them for their great support and cooperation.

Results of the paper “Research on Forecasting Electricity Demand of the 13th Five-year in Hebei Province” show that the total electricity consumption will grow at an annual rate of 3.46%-3.87% during 13th Five-Year-Plan period, which would be more than 0.4234×10^{12} kWh in 2020. The electricity consumption growth of tertiary industry and resident sectors would raise fast, which will grow at an annual rate of 8.72%-9.15% and 6.24%-6.72% during 13th Five-Year-Plan period. Moreover, comparing with the demand structure in 13th Five-Year-Plan period, the proportion for industrial electricity demand will decline by 5%, the proportions for tertiary industry and resident sector will increase by 3% and 2%. The electricity consumption structure in Hebei province would change in the future.

In the paper “A Study on The Influence of Use of Web 2.0 Collaboration Tool Reflecting Agile Practice on the Evaluation of OS Project”, for the agile development methodology that repeats the frequent releases and the short development periods, there are some value practices that they have to keep. Among them, three typical practices were selected: use of Web 2.0 collaboration tool, adoption of the test driven development (TDD) and refactoring. The agile practice that forces the communication between team members was defined with the use of Web 2.0 collaboration tool. When this is applied to the development method of open-source projects which are dispersed geographically, temporally and culturally, it is expected to raise the satisfaction of OS project users and to contribute the maturity of community. It was applied to the study models that were drawn out from the precedent studies.

In the study “Stress Analysis and Failure Prediction of Adhesively Bonded Single-lap Laminates Joints Subjected to the Tensile Loading”, on the basis of the existing experimental results and considering five kinds of failure modes, failure prediction of adhesively bonded single-lap laminates joints with adherend thickness 3mm, adherend thickness 2mm and defect in the adhesive layer under uniaxial tensile loading is performed by progressive failure analysis method. The numerical analysis of composites adhesive joints is implemented in ANSYS Parametric Design Language (APDL) with commercial finite element codes ANSYS. The error of computational and experimental failure loads is 3.0%. Evolution of adhesive progressive damage is simulated effectively and the initial position and reason of damage is discovered. Furthermore, a finite element simulation is carried out to analyze the stress distributions in the mid-surface of the adhesive layer and the bonding interface. It is found that stress concentration is all emerged near by 1.25mm on the overlap zone ends, that is the initial point of damage, and it is the main factor that the joint strength is affected by peel/shear stress concentrations at overlap zone ends. The computational results are in good agreement with the experimental values.

The paper “The Analysis on Time-dependent Reliability of Steel Structural Components under Fire Conditions” presents a straightforward and possible time-variant model of the steel beams to be resistant against fire, and also a reliability index analysis method. According to the ISO834 standard heating curve, the steel beam’s reliability is evaluated.

The purpose of the paper “A Study on the Space Hierarchy According to the Plan Composition in Outpatient Department of Geriatrics Hospitals” is to establish preliminary data for the design of geriatric hospitals through the quantitative hierarchical analysis of plane structure according to the floor plan composition of outpatient departments in geriatric hospitals. In this study, J-graph and space syntax were utilized for quantitative analysis of outpatient departments in geriatric hospitals, and the analysis target was limited to hospitals for the elderly located in Korea, where there was a rapid increase in aging population recently.

Paper “Research on Innovative Design of Mobile Cooking Table” mainly on the basis of the principle of ergonomics and the concept of humanized design, conduct the design on the overall size and construction of the cooking table from the aspect of function, material and institution to develop a cooking table with strong practicality in order to meet demands of different consumers.

Authors of the paper “Machine Learning Based Adaptive Context-Aware System for Smart Home Environment” present machine learning based context-aware system which can provide service according to the trained model. Two effective learning algorithms: Back propagation Neural Network, and Temporal Differential (TD) class of reinforcement learning are used for prediction and adaptation respectively. This approach indicates better adaptation for context-aware service due to the low error rate.

The Study “The Research of Ad hoc Network Routing Protocol Based on Energy” introduces the basic concepts and key technologies of Ad hoc, and summarized the traditional Ad hoc network routing protocol, commonly used for energy saving existing routing protocol control strategy focuses on. Introduced and compared four typical Ad hoc network routing protocols AODV, DSDV, TORA and DSR performance in energy control. After in-depth study of Ad hoc networks in the energy physical layer, MAC layer, network layer control problems, proposed an Ad hoc network routing protocols based on improved energy control - control of distributed energy source dynamic routing protocols. Finally, the proposed protocol simulation, reflecting its advantages in energy control.

In the paper “Studies of Large-scale Antenna Beamforming Technology”, the large-scale antenna has the advantage of application is strong, it can greatly improve the average throughput of the system, but also can save transmission power, becoming one of the key technologies of the fifth generation mobile communications. However, in FDD system, the sender configure a large number of antennas, the access of channel state information has become a problem to achieve; for this problem, they propose a bit allocation scheme, this scheme is based on jointly zero forcing beamforming, using random vector quantization method, and getting a better performance, the success of the application of traditional finite feedback technology to large-scale antenna system, the simulation results show the effectiveness and correctness of the proposed algorithm.

Authors of the paper “A Study on Cooperative System between Devices to Construct Internet of Things” design An XML schema on devices for collaboration between devices and implement the device manager, which defines the relationships to enable collaboration between devices. When the device’s relationship is redefined by the manager, they used the compact embedded system in Arduino and OpenWRT while

designed and implemented the prototype system that enables collaboration between devices through an XML schema.

The paper “Design of Light Source System and Optical System for a Static Star Simulator” introduced a scheme of using cold cathode planar backlight, and presented the power supply circuit for light source. According to the analysis, parameters of static star simulator were determined, and then a large field, small distortion and small field curvature collimating objective lens was designed by using transmission optical system. The imaging analysis results show that the design can satisfy the request.

In the study “Research on Traffic Journey Intensity of Residents Based on Gravity Model”, in order to accurately predict the traffic journey intensity of residents along the highway, according to the mechanisms of production of the traveling, analyze the influences of traffic journey intensity of residents from the three angles including residents' willingness to travel, destination's attraction, traffic resistance, and predict the traveling intensity combined with the unconstrained gravity model. Then introduce the sensitivity of travel cost and analyze the impact of sensitivity of traveling cost on the traffic journey intensity. Finally, with an instance of the radiation areas of Zhaoma highway in Yunnan, calculate the calibration parameters in the unconstrained gravity model combined with the increase method and analyze the sensitivity of traveling cost within the scope of radiation areas. The results show that there is significant exponential relationship between the traffic journey intensity and the sensitivity, and it can provide some theoretical basis for the trip distribution; the gravity model is reliable and viable in some degree, and has a certain guiding significance for planning the road infrastructures.

Authors of the paper “Novel Gateways and Sensor Nodes Applying an Object Identifier to Monitor Gas Facilities” propose two kinds of novel gateways and sensor nodes that apply an object identifier (OID) to monitor gas facilities. The proposed gateways and sensor nodes collect gas and environment data with various sensors and communicate with a monitoring server. If an exceptional event happens at the inspection site where our devices are installed, sensor nodes can take action by issuing control commands from the monitoring server. Moreover, they have also designed an OID that provides resources and devices in a gas monitoring system with a unique identification. By applying an OID to each message for transmission among sensor nodes, gateways, and monitoring servers, gas facilities and related devices can be accurately and safely managed. To evaluate the proposed devices, they properly installed our gateways and sensor nodes near operating gas facilities and verified their operation.

The study “Research on Traffic Flow Mathematical Model in Urban Traffic” take the urban road network as the object, a further study on the method of traffic signal self organization under the condition of traffic state identification and local congestion. In the urban road traffic state identification study, according to the need of traffic signal control, respectively from qualitative and quantitative point of view, the urban road traffic state is defined. In order to be able to obtain real-time traffic data as the foundation, design urban road traffic state evaluation index system. Based on the current mainstream micro traffic simulation software VB and VISSIM as the tool to build the experimental platform, and set up the UTC-CI (Urban Traffic Control for Congested Intersections) experimental environment, the above method is verified by simulation. The results show that the traffic state identification method and the related signal control method have the expected effect in reducing congestion duration.

In the study “Design and Realization of Personal IoT Architecture Based on Mobile Gateway”, in IoT, connectivity for local and/or wide area is fundamental to collect sensed

data from IoT field devices or to send control information to the devices. Up to now, most of IoT devices equip still personal area level wireless radio interfaces due to cost of radio modules, energy consumption, and subscription requirement of wireless cellular networks such as 3G, WiMAX and LTE. In order to collect data from such devices possibly moving in the Internet, a gateway or relay node that can transfers the data using wide area communication techniques is necessary. A smartphone which provide a tethering function can play a role of the gateway for personal IoT environment and it does not require additional subscription for personal IoT devices and provides location independent connectivity. In this paper, they design personal IoT architecture based on mobile gateway and realize it with two case studies, remote control of car navigation system and home automation examples.

In the paper “The Research on Hotel Customization Capability Influence Mechanism Based on Biological Double Helix Gene”, in today’s hotel industry, how to effectively balance the benefit of the customer demand and the supply resources has received widespread attention. This article put forward the connotation of hotel customization capability and “double helix gene” structure model which integrates customer demand, the hotel product characteristics with standardization production factors for customers, and discusses the relationship of different customization performance and enterprise capability; accordingly summarize the influence mechanism of customization capability.

Authors of the paper “A Study on Construction Elements of New Rural Sports Culture in China and Related Influence: an Empirical Analysis Based on Online Survey” test the development status of new rural sports culture in China by using online survey. Factor analysis results show that, $KMO = 0.883$, Bach Wright test value $X^2=116.128$, $P=0.000<0.01$, there are 4 common factors, including "material sports culture factor", "spirit sports culture factor", " system style education factor" and "behavior sports culture factor". Contribution rate as 35.272%, 19.376%, 10.495%, 9.809%, the cumulative contribution rate is 74.952%, and there is a high degree of correlation between them.

The paper “Performance Analysis of a Tour Scheduler Focusing on Time-Dependent Gains for Electric Vehicles” conducts an extensive analysis of its performance through a prototype implementation. Main concerns are put on the acquired gain, waiting time, and tour length according to the schedule depth and the number of destinations. Basically, the scheduling service provides an interface for the tour spot manager to upload the time-dependent coupons as well as runs the tour scheduler each time a new request arrives from an electric vehicle. According to the experiment made to run on the real-life geographic tour spot distribution of Jeju City, the proposed scheme takes about 4.8 to 4.9 times as much economic gain as the legacy traveling salesman problem solver. The waiting time approaches the permissible bound specified by the explicit constraint, especially when the schedule acquires more coupons. In addition, the tour length is affected by up to 14.4 %. Here, when many coupons are available, the depth 1 vehicle can monopolize gains, but the next vehicle also takes enough economic gains.

In the paper “Simulation Model for the Decision-Making Behavior in Pedestrian Evacuation with Floor Field Cellular Automata Approach”, in order to simulate pedestrian evacuation from a room with multiple exits, an extended floor field cellular automata (CA) model is proposed to describe the decision-making behavior of pedestrians in a realistic way. The problem of the potential distortion and reciprocating route of pedestrians is solved. Meanwhile, the visual factor and the visual field are introduced to reveal the effect of visual sense on intelligent decision-making behavior of evacuees. To make the simulation more reasonable, human psychological behaviors are considered in the model, such as panic psychology, self-protection awareness, competition awareness,

etc. Moreover, the width and the layout of exits are also taken into account and the critical value is obtained by simulation. The results show that the proposed CA model is efficient and realistic in the assessment of both human evacuation and building design.

The study “Food Security Sensor Management Based on RIHA” takes the security management food security sensor management of food industry the industrial area as the researching object, discussing the architecture of ASAAC standard food security sensor management, by means of a RSSI-based Information Hiding Algorithm (RIHA) analysis method, it puts forward ideas of assessment on the food security sensor management safety. And uses RSSI (Received Signal Strength Indication) as hidden information carrier and designs. It does not affect original data or bring additional communication cost. The simulation results show that RIHA has high hidden information transmission accuracy without bringing additional communication energy consumption.

The article “Development of a Simple and Innovative Wave Energy Harvester Suitable for Ocean Sensor Network Application” represents a new idea about an innovative, simple and cost effective marine energy harvester for powering offshore sensor nodes working as part of Ubiquitous Sensor Network (USN). Betterment of these aqua farms by including these into wireless sensor network so that they could be remote controlled from far land, is needed to make this offshore farming more popular. For this step to be done one major concern is the powering process of the sensor nodes used as the key part of sensing or monitoring purpose of the offshore projects. So our study focuses on the design and numerical study of a wave energy harvesting device for supplying uninterrupted electric power to offshore sensor nodes serving as part of ocean environment monitoring network or any marine aquaculture farm. Analysis of the environmental and device sizing factors that makes the efficiency to deviate, have been discussed here. It is a novel, floating type, double chambered wave energy converter that uses the Oscillating Water Column technology for conversion of wave power into electrical power.

In the paper “Discussion and Design of Dynamic Liquid Level Intelligent Monitoring System”, the problem of how to calculate the height of the liquid level under tilting status is considered. A custom algorithm for obtaining the real height of liquid level according to the difference of distance measured by ultrasonic sensors is proposed. A set of intelligent monitoring system is designed as well. The system, which takes S3C6410 processor as the control core of the front-end system, measures distance by multiple HC-SR04 ultrasonic sensors, compensates temperature via external temperature sensor ds1820, collects data via inserting driver modules, and then gets the liquid level angle by means of the difference between distance, to calculate the liquid level height, both of which will be sent via Bluetooth chip CC2541 and wireless network. The data, received by PC, will be used for graphical interface display and speech broadcasting depending on Processing software programming. The smart phone can also read data and control devices from the front-end. The results of simulation experiment of this system are considered.

In the study “Light Fades and Life Prediction of LED Light Source”, the life is the most representative parameter in the parameters of LED reliability. But the impact factor of the LED lifetime are numerous and complicated, each factor of the influence degree of each are not identical. If according to the traditional light source life test method, then the cycle is too long to not led update speed. And the majority of the LED accelerated life test by means of increasing the should force experiments to estimate the life of the LED light source, this kind of test is usually elevated led where the ambient temperature or increasing the current through the LED itself. Finally, through the acquisition of data and analysis to predict the service life of LED light source, but did not direct theoretical

foundation to justify force and the service life of LED light source specific equivalent relation. Therefore, the accuracy of accelerated stress measured the service life of LED light source is yet to be verified. Through the analysis of the change of the life of LED is a gradient of chemical reaction, with the Arrhenius model, led the life of the weakening is through changes in the flux to the lumen, and for that they can under the normal working condition analysis of LED light attenuation mechanism and rules, the prediction from but realize life led to predict led by degradation of cause and the change of life.

The research “Paseduluran: A Local Wisdom in Dealing with the Earthquake Disaster in Javanese Society” presents a theory which is very likely related to local wisdom during the post-disaster emergency period. The concept of control of space of post-earthquake market is the realization of the community’s vigilance arising due to the earthquake and was influenced by the culture of the society who has been there and continues to grow to the present. Deep exploration will reveal the rationale of the society's strategy in arising vigilance in emergency period. The concepts which were found then were further explored with transcendental depth and managed to find the paseduluran as the basis of the control of the post-quake market space. The value of paseduluran underlying the consensus of control of space of post-earthquake market includes consensus on spatial distance, space boundary, order of space, and space control. In other words, the overall consensus is based on the value of Paseduluran. These values come from the local culture of the community in Bantul Regency which is proved to accelerate the recovery of the community to normal life.

The paper “Design and Construction of the Virtual Cloud Platform for the Laboratory” construct a virtual cloud platform laboratory, based on the cloud technology. Introduce the design, construction and architecture of the cloud platform in detail. Analyze the advantage and security of the cloud platform. It has low cost of hardware and software, small late maintenance, and centralized data management, the security of data is greatly improved, compared with the traditional computer (PC) laboratory. Meanwhile the virtual platform also has the all characteristics of the real computer. The virtual cloud platform of the laboratory is the trend and direction of the development of the computer lab in the future.

In the paper “Study and Analysis of Semiconductors for the Development of Two-layer Solar Cells”, in the field of renewable energies, researchers have always looked for the improvement of the conversion method in solar cells, due to the fact that only 14% of the electrical potential is being used. That is why in order to increase efficiency, different designs and materials have been studied. One of the most viable ways is the technology of multilayer solar cells, which the recent investigations focused due to the fact this technique allows the possibility of achieving efficiencies above 30%. Despite the above, the problem of this technique is the cost of manufacturing, which compared to the commercial cells, is inferior in benefit - cost relationship. For this reason, this paper shows a study of different semiconductors to design a two-layer solar cell, with the aim of selecting the best combination of semiconductors according to their own characteristics and results according to the described method.

In the paper “Generic Information System for Chain Stores based on Borland C++ Builder”, with the rapid growth of global economy, chain stores are springing up all over the world and have dominated more and more service markets, e.g., retail and dining. Accordingly, chain businesses have been one of the fastest growing industries since the beginning of this century. However, there are many bottlenecks for further producing competitive advantages of chain businesses, such as relatively small scales of chain stores, rather weak information awareness of managers, incompetent staffs and diversified

business processes of chain stores, by using the traditional manual management. The introduction of chain store information systems, which integrate usually comprehensive information technologies, could provide managers of chain stores with a decision making yet overall management platform. In this paper, they develop a generic yet efficient information system for chain stores using MIDAS based three-tier client-server architecture. Besides, they also illustrate the system from three most principal stages in software engineering, which are system analysis, system design and system implementation.

In the study “The Smart Eye Frame Based On Internet of Things”, protecting the eyesight has become one of the most current concerns in China, especially for the adolescent group. This design is a tool of protecting the eyesight for preventing the myopia. It is based on the ultrasonic sensor, photosensitive resistance, Bluetooth, the voice module and the smart telephone. It discusses the hardware design and software control for the eye sight protection. It uses CC2530 MCU as the core chip. Its circuit is to achieve the low-cost, high-precision, minimized eye sight protection. It is simple to operate. It includes the strong anti-jamming capability. Now the smart eye frame is heavy because of the battery. But it can supply power by the charger in order to reduce the weight. The initial survey shows more than 50% of students and parents lack the basic science knowledge for caring the vision. Therefore the design of a vision protector to protect eyesight is particularly important. The design of the hardware includes the circuit of the transmitter and the receiver in the ultrasonic, the alarm circuit, the circuit of detecting the light intensity, and Bluetooth communication circuit. The market has no similar products.

In the paper “Design & implementation of an Air Quality Monitoring System for Indoor Environment based on Microcontroller” Indoor air quality is a very important parameter for living environments, which is closely related to people's daily work and health. However, nowadays, the environmental pollution, haze weather and other issues have become increasingly prominent. In this context, it is necessary to design an automatic detection device for monitoring the air quality in buildings. In this paper, an indoor air quality monitoring system was designed and implemented based on LPC2148 micro-processor by means of the sensor technology, embedded technology and communication technology. The system could simultaneously monitor a variety of harmful gases and monitoring gas and setting alarm values according to the requirements of the indoor environment, such as indoor temperature, humidity, formaldehyde and methane, as well as PM2.5. All of the measured data is transmitted to the remote server to process through Ethernet. The experimental results show that, the system works stably and has high accuracy, which has broad market prospect.

In the study “Research on an improved differential evolution algorithm based on three strategies for solving complex function”, for the shortcomings of differential evolution algorithm(DE), such as the low convergence rate in the late evolution, easy to trap into the local optimal solution, and weak situation of the global search ability and the stability of optimization, an improved differential evolution algorithm based on multi-population and dynamic local search(MPDLSDE) is proposed in this paper. In the MPDLSDE algorithm, different populations select different mutation operation model in order to obtain superiority reciprocity between different models in the process of evolution. And the random selected method and small probability perturbation are used to increase the diversity of population and balance the exploitation ability and exploration ability of the algorithm. Then dynamic local search method is used to solve the current optimal solution in order to speed up the convergence rate. Several well-known benchmark functions are selected to validate the efficiency of the MPDLSDE algorithm. The simulation experiment and comparative analysis results show that the MPDLSDE algorithm can

enhance the global convergence ability and get the high accuracy solution in high dimensional complex optimization problems.

The paper “Internet of Things (IoT) Framework for u-healthcare System” studies the u-healthcare system with respect to the Internet of Things (IoT) perspective. Mainly, the mover of IoT for u-healthcare is the integration of different technologies and computing system. These include sensor devices to gather patient’s physiological data, u-healthcare cloud server and wireless technologies. To address the interoperability limitations of different devices the mobile gateway architecture for u-healthcare and the tiers of u-healthcare system IoT was presented.

November 2015

Carlos Ramos, Instituto Politécnico do Porto, Portugal

**Editors of the November Issue on
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Paseduluran: A Local Wisdom in Dealing with the Earthquake Disaster in Javanese Society

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Abstract

This research presents a theory which is very likely related to local wisdom during the post-disaster emergency period. The concept of control of space of post-earthquake market is the realization of the community's vigilance arising due to the earthquake and was influenced by the culture of the society who has been there and continues to grow to the present. Deep exploration will reveal the rationale of the society's strategy in arising vigilance in emergency period. The concepts which were found then were further explored with transcendental depth and managed to find the paseduluran as the basis of the control of the post-quake market space. The value of paseduluran underlying the consensus of control of space of post-earthquake market includes consensus on spatial distance, space boundary, order of space, and space control. In other words, the overall consensus is based on the value of Paseduluran. These values come from the local culture of the community in Bantul Regency which is proved to accelerate the recovery of the community to normal life.

Keywords: *Boundary of space; Space arrangement; Spatial control; Spatial distance; Paseduluran.*

1. Introduction

After created, a space will grow and develop along with the human who dwells in it [1]. The understanding of space includes the physical form and the activities of human in it, involving the ideas and values functioning as bases. These activities then give life, meaning, and value for that space. The creation of space is based on the ideas and thoughts as a reflection of view, thought, and values of a community. This is also stated by Norberg Schulz that the understanding on space can include the physical and psychological aspects [2]. Humans will give different responses to their physical environment, depending on the understanding, ideas and thought perception, which is closely related to their cultural background. That is, humans as users control the development of a space.

Earthquake with the magnitude 6.9 on the Richter scale paralyzing *Daerah Istimewa Yogyakarta* (DIY) on of special provinces in Indonesia on May 27, 2006 causing more than 6000 deaths, injuries, physical damage, infrastructure damage, and economic damage. This disaster then raises public awareness. The society with low economic level was the group with the most social economic proneness to the disaster [3]. Nevertheless, in the earthquake of DIY in 2006, this group proved to be able to manage to stand on its

feet again. This was indicated by the rise of the economic activities of the societies as their life support. The response of the society to the disaster would be likely to bring on the ideas, habits, and beliefs that are preserved in the society memory and motivate them to carry out particular actions to solve it [4]. In the periods of disaster preparedness until the rehabilitation and reconstruction after-earthquake DIY 2006, the activities were mostly in forms of attitude and behavior of the market society to the surrounding. These attitude and behavior also influenced the physical form of space where they did their activities. Basically, a market can be seen as the psychological, social, and cultural reflection of the society that uses it [8, 9].

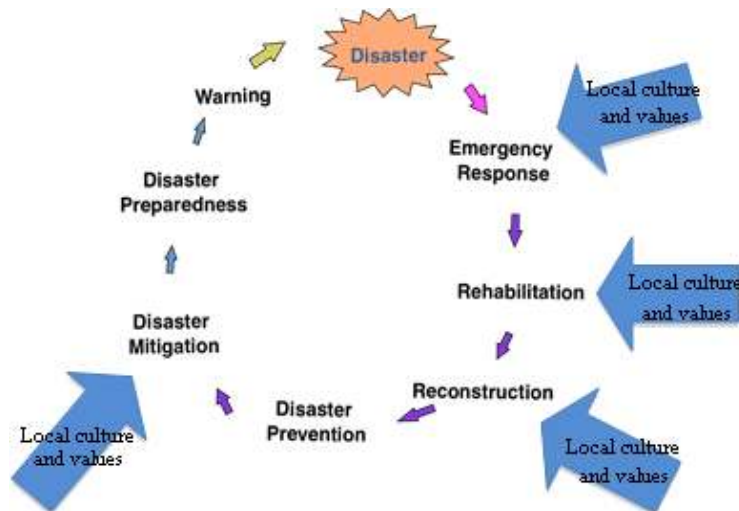


Figure 1. The Contribution of Local Culture and Values in the Enhancement of Resilience in the Disaster Management Cycle [5,6,7]

Therefore, this paper presents a development process and response or reaction to market spatial after the disaster of DIY 2006 which can be studied to reveal the basis of thinking, value, and culture as the background. This is interesting to study further concerning the possibility to discover spatial theory which very likely related to the local wisdom in the post-disaster emergency period that is evident to be able to guide the society to recover from the disaster in relatively short period. The culture and values can be the builder of local defense of the community in the disaster. In the disaster management cycle, this can be likely to contribute specifically to the response, disaster preparedness level, rescue, rehabilitation and construction, and disaster mitigation. In this cycle, local culture and values increase the resilience which is the ability of a community to face the disaster and get recovered to the normal condition [10] as described in Figure 1 above.

The rest of this paper is organized as follow. Section 2 describes related works. Section 3 describes the proposed method. Section 4 describes the main results on spatial concepts of post-earthquake market spatial in Bantul regency. Section 5 describes spatial control of post-earthquake spatial in Bantul regency. Finally, the conclusion of this work is described in Section 6.

2. Related Works

In the recovery process after the earthquake of DIY 2006, we can get a lesson, namely local wisdom that we can deeply dig up. The process of development and the

responses toward the market spatial in the period of disaster preparedness until rehabilitation and reconstruction after the earthquake of DIY 2006 can be dug up to reveal the basis of thinking, values and culture playing as the background [11]. Culture and local values of the society can enhance the resilience and guide them in facing the disaster to be recovered to the normal conditions. Therefore, culture and local values of the society are a form of local wisdom [12, 13]. In the disaster management cycle, this local wisdom has made a significant contribution, especially on the stages of response/disaster preparedness, rescue, rehabilitation and reconstruction, and disaster mitigation [14, 15, 16].

In the disaster event, the local wisdom can guide the society of Bantul Regency generally to be recovered to live their daily life. The recovery of the economic activities which is the generator of the society life recovery is one of the local wisdom exploration entry points that is possibly to develop as the local concept as the reference for the recovery attempt in other places. This specific character can form an identity to a place in general which is called sense of place [17]. The understanding of place value is the understanding of the uniqueness and individuality of a certain place in specific, which is a variant among the other uniqueness varieties.

The understanding of space involves the physical form and the activities of the human inside of it. The activities give life, meaning, and value to the space. The understanding of space also involves both the psychological aspect (definition of space) and the physical aspect (definition of place) [18]. In this relation, human is the change agent with the power to organize and control the space as what they want [19].

Space is always associated with activities. Space describes more on its spatial aspect, while the connection with the activities inside of it gives wider and more complex understanding to space. Activities always involve four main things: actor, type of activity, place, and time of activity. The relation between space spatially and activities is called as setting. The tightness between space spatially and human doing the activities gives the basis in understanding that setting includes three aspects, namely: human as actor, type of activity, value system, and culture formed the interaction process between human and the space [20]. The cultural component includes language, knowledge system, social organization, life tools and technology system, economic system, religion system, and art. The form of culture includes idea, activity, and physical work [21].

In sociology, human and culture are considered as *dwitunggal* (two as one) which means that both are different, yet they are united. Human creates culture, and after culture is created, culture regulates the human life to fit the culture. Every human being has his own uniqueness. The uniqueness will influence his surrounding environment. In contrast, the uniqueness of his surrounding environment can also influence his behavior [22]. The surrounding environment is not only a place for human to do activities, but it is also an integral part of human behavior pattern. Human behavior will influence and form his environment physical setting. On the other hand, the surrounding environment can affect the human behavior.

The relation between space and its occupant (human) is a record of the human life which if it is investigated, it gives a picture of his behavior and its change during the occupancy period [23]. In the relation between environment and human behavior, there is an emphasis on the human cultural background, such as life perspective, belief, values and norms which will determine the individual behavior reflecting in his way of life and role chosen in the society [24]. Moreover, this cultural and social contest will determine the human activity system [25].

Market is a place used to serve the community economic activities. The discussion on space can be observed from two different views, those are: a) space as a product – space is seen as a result/product of an activity. This view sees space as something formed and influenced by the activities of the user inside of it, which can take place in a short or long period of time [26, 27, 28]. In this case, space is created due to setting demand of an

activity. This point of view requires the development of related knowledge with the clarity on the process of creating the space as to use it as an input for the reproduction activity of a space. In this understanding, a space can be categorized as an object, a thing affected by the activities of the user; and b) space as work – a space is seen as thing that can form or direct an activity. In this case, a space is seen as a thing that influences the activities and users inside of it since the space is created earlier than the activities served. In this process, revisions on the space by the user often take place. In this view, a space can be categorized as subject, which is active and influences or forms the activities of the users. The behavior approach emphasizes on the relation between a space and the human and the society who also reside or just use the space. In other words, this approach observes the norm and cultural aspects. Different society will result in different concepts and forms of space. Behavior setting is the interaction between an activity and more specific space [29]. Behavior setting contains the components of a group of people who does an activity, a place where the activity is carried out, and particular time when the activity is carried out. From the definition it can be concluded that in a component of space or several activities there is a structure or series that makes an activity and the actor have a meaning. Conceptually, behavior approach stresses that human is a creature who thinks. Regarding this matter, there is cognitive process that is a process to understand and give meaning to an environment.

The connection between space and human needs to be explored using phenomenology paradigm in line with the adjustment between the architectural phenomenon and intentionality aspect as one of the stages of thinking. Human in this scenario is viewed as the origin of intentionality genesis [30]. Another important phenomenology stage is the reduction including eidetic reduction, phenomenological reduction, and transcendental reduction, which emphasize on the whole reality to get the awareness that gives transcendental meaning to what is truly an integral part of our awareness [31]. Phenomenology paradigm referring to human life is a right paradigm to state the life perspective, belief, values and norms that will determine an individual behavior, which will be visually reflected in a space as realization of physical culture.

During the process of activity, human keep enlivening a space through space utilization, lay out, and adjustment. The interaction between human and the space is a reflection of views, thoughts, and values that he believes which also undergo changes as the time goes on and are influenced by various experiences. Therefore, the relation between a space and its user is a record of the life experienced by an individual if it is investigated, it can give a description of his thoughts, values, and culture.

Earthquake occurred in May 2006 is a disastrous event to the people of Bantul Regency. During some time after earthquake of May 2006, the life of the people had not yet returned to the normal condition as before the earthquake. The raise of the market activities in Bantul Regency can be seen through the market utilization a while after the earthquake [32]. Considering that earthquake is not an expected event, there is a possibility that the market society did the particular responses to the market spatial that can be observed, especially during the period of disaster preparedness until rehabilitation and reconstruction after earthquake. The market utilization is an interesting phenomenon to find the possible concepts developed by the society to reach life stability after disaster.

3. Proposed Method

The study on the connection between the spatial and the activities in the market is explored in the period of disaster preparedness until rehabilitation and reconstruction period after disaster with the entry point the earthquake event in May 2006, with the understanding that the momentum is a historical event. Related to that historical event, we will find the philosophical theoretical and conceptual formula that probably influences the control of market spatial. The control of market spatial in the period of disaster

preparedness until the period of rehabilitation and reconstruction after earthquake of DIY 2006 is viewed as a phenomenon that needs to be understood as what it is. Consequently, we need to focus our attention on the phenomenon without any prejudice and without imposing theories. The attention needs to be concerned on the system to reveal the principles [33].

The research question 1 is: “What kind of market spatial has developed after the earthquake (from the disaster preparedness period until the rehabilitation and reconstruction period) of DIY 2006?” To answer this question, the connection between space as physical order, humans (with their activities and culture), and environment as context is explored according to the natural condition. In the beginning the research was conducted in 8 (eight) markets in Bantul Regency (Piyungan Market, Jodog Market, Pundong Market, Ngangkruk Market, Turi Market, Gatak Market, Niten Market, and Bantul Market) and 3 (three) markets in Gunungkidul Regency (Wonosari Market, Merdeka Market, and Playen Market) to find the research focus. Exploration conducted by phenomenological depth found empirical themes. Furthermore, the exploration was focused on the 6 (six) out of 11 (eleven) markets, those are Piyungan Market, Jodog Market, Pundong Market, Ngangkruk Market, Turi Market, and Gatak Market. This is based on the empirical themes repetition during the research process.

Research question 2 is: “What responses influence the development of the market spatial after earthquake (from the disaster preparedness period until the rehabilitation and reconstruction period) of DIY 2006?” To answer this question, the search on realities and information on field was conducted with the eidetic depth. Empirical themes found in 6 (six) markets was deeply analyzed to find the inductive concepts of control of market spatial. In the end, the themes were specified into 5 (five) markets, namely Pundong Market, Ngangkruk Market, Turi Market, Gatak Market, and Jodog Market. Of the five markets explored, Pundong Market was the most intensively explored market because the most empirical themes were found here.

The research question 3 is: “What matters caused the responses of the users toward the market spatial developed after earthquake (from the disaster preparedness period until the rehabilitation and reconstruction period) of DIY 2006?” To answer this question, information investigation was carried out until transcendental depth, which is the understanding of objects through continuous and intensive acquaintance [34]. In this process, the information was fortified and induced into the themes, which then constructed into the concepts. The deepening was conducted in 5 (five) markets, namely Pundong Market, Ngangkruk Market, Turi Market, Gatak Market, and Jodog Market that represented the empirical themes complexity found. An intensive approach was carried out by the researcher to the objects to obtain the description of various phenomena in the market from the market community. The intensive closeness between the researchers and the objects was maintained for the clarity of the phenomena studied and the success in creating and finding of the principles of control of market spatial. As a result, the essence/principle of control of market spatial is near the subjective knowledge instead of objective knowledge. This subjectivity can be subsided and changed into objectivity through the inter subjective dialog process with other informants because in the dialog process there is collective constitutional process on the same object which will result in the finding on the principles of control of market spatial that is relatively objective.

To avoid the researcher subjectivity, the triangulation was conducted – finding other similar data to test the information correctness [35]. The research was not conducted once only but in iterative observation.

Market observation was conducted by seeking understanding market as a *papan* and as *panggonan*. Market community comprehends *papan* as a place to do something, which is closely related to the physical understanding of place. Meanwhile, *panggonan* is understood as market as a place to live (to use), which has wider definition as a place to do activities with all kinds of processes and development. The understanding of

panggonan includes physical and psychological understanding of place as described in Figure 2.

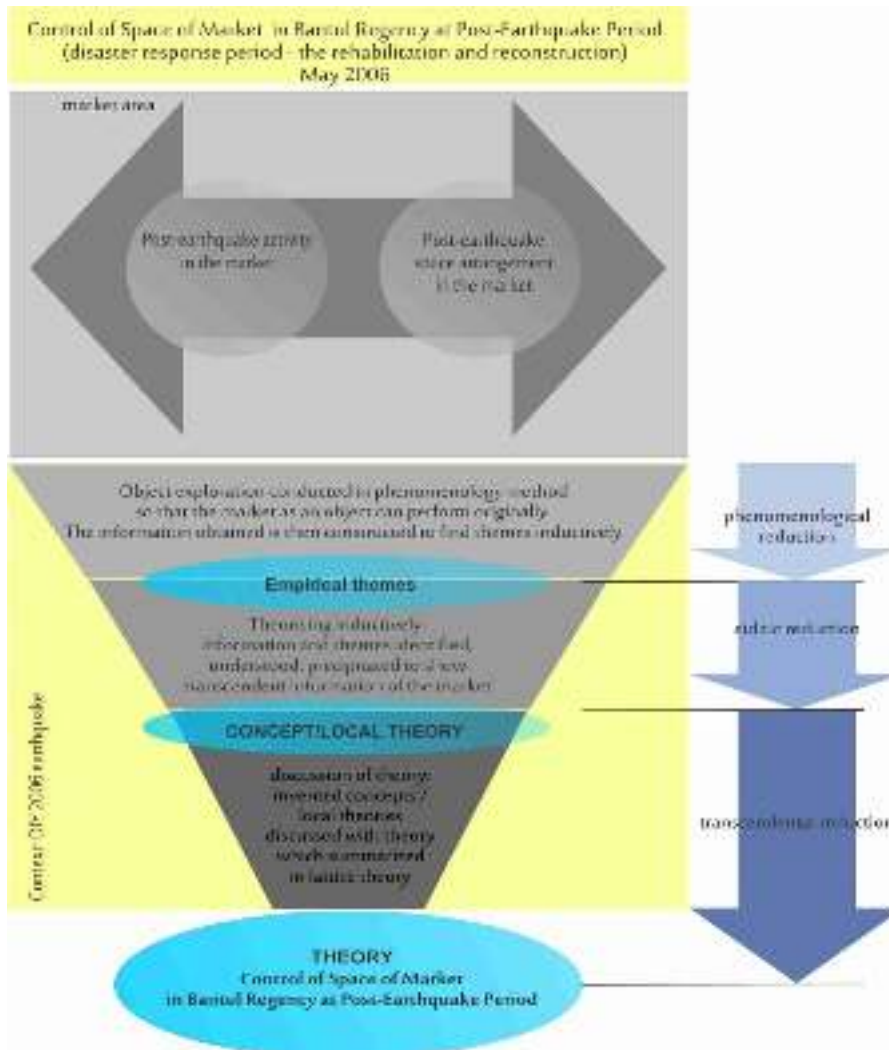


Figure 2. Conceptual Underpinnings of Research

4. Spatial Concepts of Post Earthquake Market Spatial in Bantul Regency

The research on the control of post-quake market space is done in three (3) level of depth; they are phenomenological, eidetic, and transcendent. In the early stages of this study, the phenomenon of control of post-quake market space was observed based on reality. The observation is done since May 2006 to early January 2008.

Empirical themes found through phenomenological depth in the research on control of market spatial in the period of disaster preparedness until rehabilitation and reconstruction period after earthquake involves several information: 1) able to be visited, used, organized by all people, 2) related to the way of displaying selling items, 3) showing the role of market in family nurture, 4) showing the role of market in expanding the social relation, 5) showing domination of social aspect in economic activities, 6) showing the role of market in developing brotherhood (*seduluran*), 7) showing the market utilization as a place to meet and get fun, 8) showing the change in market space

management, 9) describing market as an open space to accommodate various opportunities, and 10) showing the market role in disseminating information, knowledge, and culture of the community. These empirical themes having built the market spatial concept in Bantul Regency during the period of disaster preparedness until rehabilitation and reconstruction period after the earthquake (28 May 2006 – 12 January 2008) inductively are 1) market as a public space, 2) market as display space (*dhasaran*), 3) market as family nurturing space, 4) market as a media for social expansion, 5) market as socioeconomic space, 6) market as brotherhood (*paseduluran*) space, 7) market as chatting and fun space, 8) market space management change, 9) market space openness, and 10) market as information, knowledge, and culture network. Concepts of market spatial after the earthquake are as follows.

4.1. Market as Public Space

In the beginning, market was developed as economic facilities of the society. However, in its development, market accommodates various other activities that give more specific nuance to market. The combination of economic and social activities in the market has happened before the earthquake of May 2006. However, in the period of disaster preparedness until rehabilitation and reconstruction period after earthquake, the social aspect significantly developed and dominated market. In this period, market had also become a favorite quilting bee for people of any ages. They did this to feel safe because they were close to each other and feel secured.

4.2. Market as Display Space (*dhasaran*)

The vendor society called the space to sell their products in the market as *dhasaran* (display space), with the understanding that it was a space to *ndhasarke* (display) their products. In this case, market was understood as a place for selling (*bakulan*), which is a place to display their products to attract buyers to buy.

4.3. Market as Family Nurturing Space

One of the activities often found in the market during the research was nurturing activities. This created specific spectacle in markets in Bantul Regency during the period of disaster preparedness until rehabilitation and reconstruction period after earthquake because nurturing children was generally the activity that should have been done at home and market should have been a place used to selling-buying activities. The vendors understood the buying-selling activities as an activity to earn money that was conducted informally, therefore, the activity could be managed as they wanted and needed. The management of the activity could be done without abandoning the principal obligation of human being, namely having children and nurturing them. During the period of disaster preparedness until rehabilitation and reconstruction period after earthquake, the motivation to be together and protect their children was increasing. The location of the markets which was not far from their houses enabled them to bring the selling-buying activities closer to their families at home.

4.4. Market as Social Expansion Media

Thick social atmosphere created specific characters of the markets in Bantul Regency during the period of disaster preparedness until rehabilitation and reconstruction period after earthquake that was at only as economic space. High intensity of meeting among the market users and their families/children built strong and friendly relation among them. The built a community, namely market community. The order of selling activity in the markets in Bantul Regency after earthquake of May 2006 was closely related to other activities of society life cycle, such as nurturing children, taking care of family, family

interaction, or social interaction. The interaction among the members of market society occurred freely and sometimes unplanned. Various activities developed in market society influence the development of those markets spatial. During emergencies period, the new *bakulan* spaces developed in groups. The process of space forming happened naturally along with the development of social activities. During the utilization, the space kept changing caused by the dynamics as required by the users and other space interventions.

4.5. Market as Socioeconomic Space

The *paseduluran* (brotherhood) concept that is strongly rooted in the market society drives them to always strengthen old *paseduluran* and develop new *paseduluran* between each other. This is shown from the complexity of the activities in the market and the space order physically. The space for selling and buying activity was developed into semi-open collective room, without vertical partition between one and another room. New *bakulan* space was developed in groups. This order developed due to the requirement of physical closeness between one user and another user; among vendors, between vendors and buyers, among vendors' families, and between vendors' families and buyers. The vendors liked this arrangement because it could accommodate various interactions and communication between one user and another user. Both visual and oral communication were conducted freely between one selling space and another selling space and between the users located inside the market and the ones located outside. This gave ease to the market society because they felt of being close with their brothers. The relation closeness among the users developed due to the 'family' concept of the market society. This understanding developed due to the concept of brotherhood (*paseduluran*). The perception developed in the market society is the closest family is the people around us. Family relationship is not only because there is blood relationship among the family members, but also due to the feelings of interdependency, empathy, and the need to take care of each other.

4.6. Market as Paseduluran (brotherhood) Space

During the period of disaster preparedness until rehabilitation and reconstruction period after earthquake of May 2006, the domination of social values was very obvious in the relation occurred in the market in Bantul Regency. The interaction closeness among the market users was carried out by putting brotherhood as principal value to be able to build new brotherhood in the market society. In any observations, the nuance of brotherhood could be strongly felt in any market activities. This atmosphere was deliberately created by the market users after earthquake of May 2006 to response the disaster. The motivation of the market users to always develop and maintain this brotherhood was realized in many activities showing their strategies to minimize the possibility of conflict among the market society.

A communal selling space developed by minimizing the partition between one room and another room, simple arrangement, and lower space control in order to develop the social relation among the users and more intensive interaction between vendors and buyers. The physical closeness of the market users was a response of their expectation to keep the relation and closeness between each other. The implementation of *paseduluran* (brotherhood) value by the market society guided them to strengthen the interaction and brotherhood already built and also to build new relation and brotherhood.

4.7. Market as Chatting and Fun Space

One of the phenomena found in the market during the period of disaster preparedness until the rehabilitation and reconstruction period after earthquake was the increase in the amount of time for activity in the market and social relation among the market community. They spent time to sit and relax, chat with the vendor fellows, buyers, or

other market users after *bakulan* activity. During market day, this social forum was observed increasing in number. They utilized the market day as a routine event to meet the long acquaintances, relatives from far places, and to build new relationship. Beside vendors, suppliers, and buyers, market day was also celebrated by entertainers. We could see entertainers, such as magician, game and toys vendors, and musician in this event. There were also the vendors who combined selling their product while also entertaining to attract more people to buy.

During the period of disaster preparedness until the rehabilitation and reconstruction period after earthquake, there were many people expecting to meet their acquaintances or relatives from other places. There were some people expecting to get or buy things that they needed that were not sold in the daily market, and there were some people who wanted to send messages to others via the market users that they could only meet on the market day. There were also some people who wanted to get some fun, and there were some people who wanted to give their children some fun in this event. Those people were really looking forward to this market day event, so this event could give fun as if they were celebrating something.

4.8. Market Space Management Change

The utilization of market in the research location during the period of disaster preparedness until the rehabilitation and reconstruction period after earthquake was shaped through the consolidation process between the users and the society in general. In the development of market utilization, the rights to manage the vending space in the market could be bought. This means that in this process there was a transfer of rights to manage selling space in the market. In the process of transferring the rights to manage selling space in the market, there was basically territorial re-order. In this case, the individual authority limit over an area was redefined as the implementation of the administrative process of the space ownership. This process resulted in the new space forms in the market, such as *bango*, *los*, kios, and *warung*. Basically, this process was the society strategy to attempt to manage the spaces orderly so that the relation between the market users could be maintained harmoniously.

4.9. Market Space Openness

One stood out from the selling activities in the market during the period of disaster preparedness until the rehabilitation and reconstruction period after earthquake was their orientation in expanding the brotherhood relationship as one of the non-material benefits. This was realized by opening and loosening the area limits between the market space users to enhance the close relationship between them. The expansion of brotherhood was one of the strategies of the society to response awareness caused by the earthquake of May 2006. The economic room which usually had profit value and required privacy became an open space for the market users. The openness showed the acceptance and trust among the market users.

4.10. Market as Information, Knowledge, and Culture Network

Another character found in the research location was market mobility. Most of the market experienced fluctuation in the intensity of selling activity at specific times in line with the Javanese dating system (*legi*, *paing*, *pon*, *wage*, *kliwon*). This time cycle is called *pasar* (*pekenan*). Each day of the *pasar* cycle has the highest activity intensity and a market is named after the time cycle (such as *legi* market, *paing* market, *pon* market, *wage* market, *kliwon* market). With this system, the selling activities move from one place to another place, so the economic transaction will evenly be distributed to all areas in the region. During the period of disaster preparedness until the rehabilitation and reconstruction period after earthquake, the market mobility was used by the society as a

social network to increase the intensity of meeting and brotherhood among them. This strategy was proven effective in promoting the recovery acceleration of the society from the damaged caused by the earthquake. This network built various other systems, those are: a) *pekenan* information system, intensive interaction after the earthquake of May 2006 among market community in several markets that was utilized for information dissemination; b) *pekenan* cultural system, the mobility of the activists of selling in several markets supported the culture dissemination and acculturation; c) *pekenan* knowledge system, intensive interaction after earthquake of May 2006 between humans and their cultural background with various knowledge background followed by the knowledge exchange. This interaction was followed by social, cultural interaction and knowledge exchange among the activists.

The concepts found in this research were specifically built in the emergency condition after the earthquake. The research that was conducted during the period of disaster preparedness until the rehabilitation and reconstruction period after earthquake found the empirical themes related to market spatial. The careful consideration on the themes successfully revealed the response of the market society that further influenced the development of market spatial.

The emergency context after the earthquake has built specific understanding of the market society of Bantul Regency toward market spatial as a place for the activities to soothe the mind and economic activities that were performed based on the brotherhood value. In this case, the market spatial developed to fulfill the tranquility needs of the users. The need to calm them appeared due to the earthquake of May 2006. The strategy used by the market society was by looking for the feeling of safe and comfortable by increasing the intensity to be together among them. The market spatial also developed to fulfill the economic needs of the users. The strategies taken by the society to response the earthquake of May 27, 2006 were oriented on the interaction management inter-individuals. Those strategies are: 1) strengthening the old brotherhood; 2) building new brotherhood; 3) minimizing the conflict potentials; and 4) attempting common goodness as described in Figure 3.

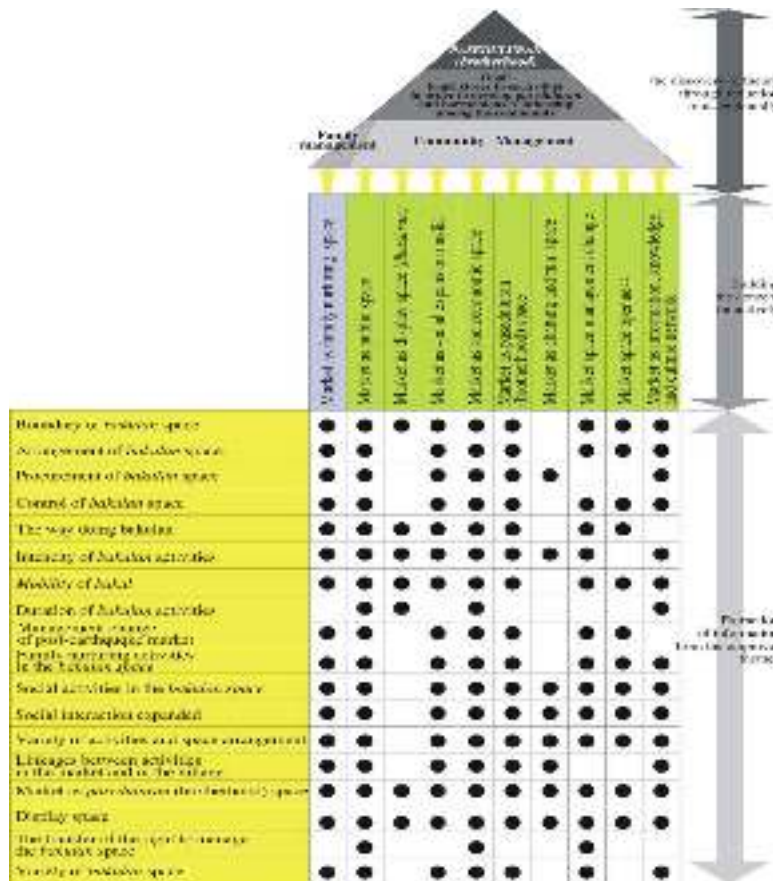


Figure 3. Extraction of Information from the Empirical Themes to Build Concept and Find the Brotherhood Value (*paseduluran*)

5. Spatial Control of Post-earthquake Market Spatial in Bantul Regency

Generally, the concepts of space found in the related markets shows that in general life practices of the society in the research location were related to the efforts to manage the interaction between one person and another person. This strategy was oriented to create a harmonious relationship between each other. This is based on the brotherhood (*paseduluran*) spirit/value.

The earthquake of May 2006 caused awareness to the market society. This awareness resulted in the disorder to the human life process. Based on deep exploration, the reflection of the strategy reveals the faith of the market users which serves as the basis of all of their thoughts, attitudes, and behaviors which is also reflected in the physical form of market spatial. The faith is *paseduluran* (brotherhood) value.

In this research can be captured visually distinctive character of post-earthquake market spatial in Bantul Regency. Development of the market space in the emergency response to the rehabilitation and reconstruction after the earthquake is related to the distance between spaces, the space boundary, space arrangement, and space control. Physical realization of control of market spatial during the emergency period was based on the value *paseduluran* and shows some consensus on the control of post-earthquake market spatial.

5.1. Paseduluran in the Context of Consensus of Distance Between Spaces

Damaged and collapse of *bakulan* spaces due to the earthquake in 2006 was responded with the improvement and development of new *bakulan* spaces. *Paseduluran* is a local value which is underlying these responses which was implemented in developing new *bakulan* spaces are clustered adjacent to the distance between the spaces one another. This is the realization of the needs of market users to get closer to each other in order to develop *paseduluran* and harmonious relationship among the community as described in Figure 4.



Fig 4. Consensus of Distance between Spaces in Control of Post-quake Market Spatial in Bantul Regency Developed based on the *Paseduluran*

In larger areas, the mobility of *bakulan* activity in various markets in the system of *pekenan* also establish a specific atmosphere on control of post-earthquake market spatial. The system build many cycles of *pekenan* users in different market cycles, each consisting of a series of five market according to the Javanese calendar. Rotation of *pekenan* users which is occurs in a variety of market cycles are not always equal. The system is build different slices of the market society. The motivation to develop a harmonious brotherhood as the response of post-earthquake emergency conditions realized by increasing the intensity of activity in the market. This enlarges the slices of market society in rotation system of *bakulan* activities (*pekenan*). Although physically the market spaces is away from each other, but in non-physically the users of the market is close from each other. The distance between market users are not understood as physical distance, but rather non-physical distance that is the brotherhood / *paseduluran*. This means that the distance among *bakulan* spaces is determined by the proximity between the user each other. This consensus is building people's understanding of the market space after the earthquake in Bantul Regency that the distance between spaces is social distance / proximity between users of the market.

5.2. Paseduluran in the Context of Consensus of Boundary of Space

Considering the safety problems was underlying the development of market space by minimizing the use of space boundary. *Bakulan* space with minimal space boundary provides an opportunity for the intensively social contact between the consumer of markets. This market space arrangement in accordance with the market community needs to increase the intensity of social interactions among them. Social contact not only done visually, but the minimal space boundary also provides an opportunity for the occurrence

of direct physical contact (See Figure 5). Based on deep exploration, post-quake market space conceived as a communal space. The space is expanded to accommodate many *bakulan* activities. *Bakulan* activities developed as an economic activity condensed by social values. *Paseduluran* which underlying these activities developing closer ties one another. Physically, this built a consensus of boundary of space.



Figure 5. Consensus of Boundary of Space in Post-quake Market Spatial in Bantul Regency Developed based on the *Paseduluran*

5.3. *Paseduluran* in the Context of Consensus of Space Arrangement

Awareness that characterizes the post-earthquake emergency condition is also seen visually with the phenomenon of changing the arrangement of market spaces. The *bakul* reduce *Bakulan* equipment used on *Bakulan* activities or changing the way they organize and clean up his wares. This is intended to enable them to settle their *Bakulan* activity when an emergency occurs aftershocks. In addition, the reduction of *Bakulan* equipment is also aimed at getting a more spacious room that allows market users to accept more social interaction in their *bakulan* space. This strategy encourages market users to accept for other people into the circle of their brotherhood (Fig 6).

During the response to the rehabilitation and reconstruction after the earthquake, the market is a medium to intensify the development of the social relation of society. This is the strategy chosen in response to earthquake.



Figure 6. The Consensus in the Space Arrangement of Market Spatial after the Earthquake in Bantul Regency are Developed based on the Value of *Paseduluran*

5.4. Paseduluran in the Context of Consensus of Space Control

Bakulan activities was understanding as an non formal activities. It is used to manage the activities of the market flexibly adapted to their needs. Precautions were awakened in response to the earthquake motivate people to develop a harmonious relationship between one another. Mixing of several activities in this *bakulan* space effect on the control of space. Each space users lose control of the movement area. In this case, each user space allow others to acces into their area. Within the scope of the market in general, *peseduluran* also affect space control after the earthquake. This implemented in a way to loser their control of area. The proximity between the *bakul* (seller) and the wong toko (buyer) based on the value of *paseduluran*. Development of market spatial during the response to the rehabilitation and reconstruction after the earthquake is based on the value of *paseduluran* build public awareness in terms of controlling space as described in Figure 7.



Space control consider
the appropriateness of social

Figure 7. Consensus of Space Control of Market after the Earthquake in Bantul Regency are Developed based on the Value *Paseduluran*

Orientation to the development of harmonious social relationships was build a consensus of 'freedom' access to market space. In this case, market space conceived as a medium to develop social relationships, meaning 'to be' accessible to their brothers. Definition of 'should' be accessed contains an agreement that the free access of market space was carried out within the limits of social propriety. It is not written, the public agreed that the boundaries of social decency attitudes and behavior towards people who are not harming others and cause conflict between them. That is, the consensus of space control on the market after the earthquake in Bantul regency is based on the social propriety, that is *paseduluran*.

Results of this study revealed that phenomenon of post-earthquake market space in Bantul is due to the space consensus that associated with the distance between spaces, the boundary of space, fabric of space, and space control. Consensus was a reflection of people's minds embodied in attitudes, actions, and behaviors, which was implemented in the control of market space as a response to the vigilance since May 2006 earthquake. *Paseduluran* value then mobilize the community to take action in response to the vigilance. Physical implementation of these responses can be visually seen in the control of market space during the post-earthquake period. Control of post-earthquake market space has been build consensus of space as described in Figure 8.

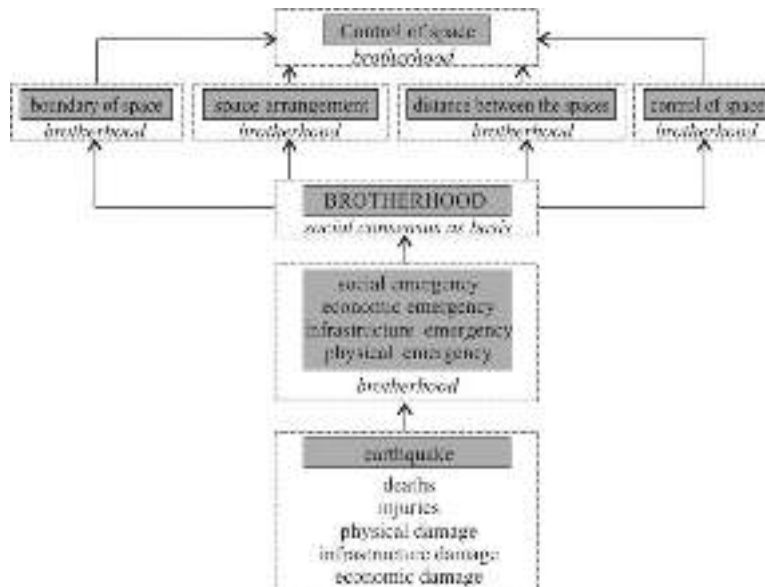


Figure 8. Consensus of Space Control of Market Spatial Post-earthquake in Bantul Regency based on the *Paseduluran*

Market spatial post-earthquake build consensus of space as follows:

- distance between the spaces on the market spatial after the earthquake in Bantul Regency based on *paseduluran* is the social distance / proximity between market users.
- boundary of space on the market spatial after the earthquake in Bantul Regency which based on *paseduluran* is social closeness.
- space arrangement on the market spatial after the earthquake in Bantul Regency based on *paseduluran* is social order.
- control of space on the market spatial after the earthquake in Bantul Regency which based on *paseduluran* is social propriety.

Consensus about the distance among spaces, boundary of space, and the space arrangement was basically related to the control of space. Consensus control of space in market spatial after the earthquake in Bantul Regency based on *paseduluran* is the social propriety. Implementation of this consensus is forming the distinctive character of the market after the earthquake in Bantul Regency.

6. Conclusion

The control of post-earthquake market space specifically awoke in a state of emergency. This condition builds people's understanding of market space after the earthquake as follows:

- Shaped as semi-open communal space which is controlled by considering the distance between spaces, the boundary of space, arrangement of space, and space control.
- Shaped as semi-open personal space which is controlled by considering the distance between spaces, the boundary of space, arrangement of space, and space control.
- Associated with human activity as a user, economic activity, physical environment, and the social order
- Developed specifically in the context of post-earthquake emergency

In the context of earthquake, the development of market spatial during the period of disaster preparedness until the period of rehabilitation and reconstruction after the earthquake is influenced by: 1) tranquility needs, 2) safety needs, and socio-economic needs. The analysis until the transcendental depth in this research found brotherhood

value as the value which gave basis the physical development of market spatial during the period of disaster preparedness until the period of rehabilitation and reconstruction after the earthquake. It means that brotherhood is a society cultural value that was used as the strategic basis to response the earthquake.

The implementation of the brotherhood theory in control of market spatial after earthquake is not limited only to one market, but it is also implemented in the wider scope to the market rotation system in Bantul Regency. The implementation of the strategies in brotherhood value in the wider scope in Bantul Regency through *pekenan* system was admitted by the society to be able to strengthen the society defense and accelerate the society recovery from the damage after the earthquake.

Consider that *pareduluran* value can help the society of Bantul Regency to recover from the wound due to the earthquake of May 2006; the researcher recommends further similar studies in other regions in Indonesia. The fact that more disasters occur in Indonesia gives the foundation of recommendation to conduct similar studies in other regions of Indonesia. This is aimed at finding the local strength of the community, especially related to the disaster management activity. The development of the local society strength is expected enhance the resilience of the society to deal with the disaster and recover to the normal condition.

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