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Melyani, S.Pd., MM

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J. Rajes Khana, M.Sc (Comp)

Head of ISCP

Rio Johan Putra, SE.,SH.,M.Si.,Ak.,CA

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Framework Assistive Healthcare based Orange computing for elderly people in Indonesia

Melyani[1] Djadjat Sudarajat[2] Yahdi Kusnadi[3]

[1] Universitas Bina Sarana Informatika, Universitas Bina Nusantara, Indonesia

[2] Universitas Bina Sarana Informatika, Indonesia

[3] Universitas Bina Sarana Informatika, Indonesia

[1]Email : melyani.myn@bsi.ac.id, melyani@binus.ac.id [2]Email : djadjat.dsj@bsi.ac.id, [3]Email : yahdi.ydk@bsi.ac.id

Abstract.

Technology was created to bring improvements in various fields of human life and green technology that currently exists is still unable to improve human health so that a condition for the unification of all research fields in social and health sciences disciplines is to improve human life, especially for the elderly. The health improvement needed by the elderly can be obtained through assisted health care through a technology design specifically for the elderly living in Indonesia. Health care designs that can be applied in the home to monitor health 24 hours without disturbing the occupants of the house or limiting the movement of the elderly, will even provide comfort so that it can improve the health of the elderly. Assistive technology can be used in homes to improve health and care for the elderly based on the Orange computing concept. Through an extensive survey, this paper will analyse the needs of the elderly by monitoring health so as to produce a health care concept / concoction developed with a smart home to provide comfort and control for families who have elderly people with a functional monitoring system and improve the health of the elderly themselves.

Keywords: Framework Assistive Healthcare, Elderly people, Orange computing

1. Introduction

Currently Indonesia, like other industrialized countries, faces challenges related to the number of older people occupying acute hospital beds due to the low availability of home and community services and insufficient nursing home care and home care arrangements. There appears to be inconsistency in elderly care services in terms of effectiveness and efficiency, and a lack of rehabilitation services, especially in the public sector. Older Indonesians generally want to remain independent in their homes or in society until old age. However many experience limited mobility, disability, and social isolation and some people who stay at home have safety concerns related to falls, mobility, and difficulty accessing health care services when they need them. Communication with friends, family, and social and health support can be limited and fragmented, especially for the elderly who live alone. Social support systems were not always easily accessible for older Indonesians.

There is a need for access and development of “Assistive” technology to monitor health and to link with service providers, such as district nurses, nursing practitioners and local Medicare residents, in addition to better technologies for accessing temporary assistance and information at home or in the community so that it will improve health. Assistive technology can be used in homes to improve health and care for the elderly based on the Orange computing concept.

1. Orange Computing

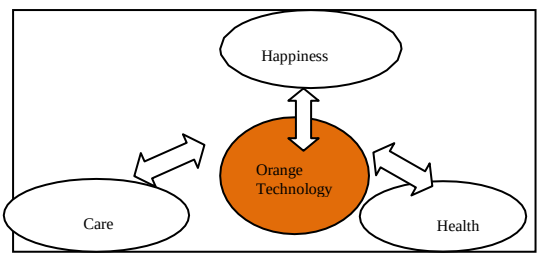
Orange computing is an interdisciplinary field of science research created to combine technological and technological innovations in health, happiness and care for human life [1] [2]. The research scope includes computer science, electrical engineering, biomedical engineering, psychology / physiology, cognitive, communication, economics and social sciences [3] [4]. The orange technology comes from the red color guide (representing brightness, health and happiness) and the yellow color (representing the warmth treatment) which is the color illustration of the orange technology [5] [6]. The goal of orange technology is to provide people with more health, happiness and care, which emphasizes the relationship between the environment and humans as assistive technology.

The way of safety and improving the human environment as we call "Assistive" to follow a healthy and happy life is to become an assistive technology based on the orange computing concept at the same speed. In addition, orange technology should be developed as an assistive technology with smart homes to improve the health of special groups such as the elderly [7] [4]. The concept of assistive healthcare in particular is considered a necessary way to improve care and make health facilities created in the home for the elderly [8] [9]. Healthcare also offer the opportunity for seniors who want to live in their own homes without help from others. Apart from that, smart homes can also help older people [10].

1.1 Component of Orange Computing

Following to Babak Ziyae (2016) that Orange technology has elements like the carbon footprint used in technology; Orange Technology also has criteria for calculating health, happiness, and warming care. Such a characteristic can be used to evaluate people and products. And also, the orange model can be decomposed into three characteristics: health, happiness, and care [11]. The following content introduces an example of each indicator (see table 1).

Table 1 Component of Orange Computing



Source : Ziyae(2016)

In Orange computing has a basic purpose to improve humanities by using technology for social care to provide happiness for humans [12], especially for the elderly. Because things

related to the environment and the elderly are a very important problem that should be sought a solution [13] , and the other thing is to recommend a system to be used by the elderly as a design used in orange computin [14]. Orange computing or can called Orange technology has both physical and non-physical components. For physical componegnts consist of: Sensor, GPS and Wireless while for Non-physical ones such as: Scalability, Monitoring, Low cost, easiness of installation and maintenance. The main goal of elderly health care is to be able to provide independence[15], comfort[16] and better communication as assistive technology[17] for the elderly so as to enable the two proposed components to improve the quality of life for the elderly[18] . And in this discussion the authors provide development for smart homes that can monitor elderly people so that they can be more independent[19]. This system uses artificial intelligence[20], multi sensors [21]and overall analysis of the needs and realities of users in receiving the proposed system[22]. The use of a number of sensors[23] [24] installed at home to measure the temperature of the room[23], knowing who came and entered the house[25], measured the light[26] , the amount of power used[26] . The device used in the house is connected to a computer that is used to identify daily habits with multi-sensing data[27].

1.1.1 Happiness

For people or products: Electrical sensors are used to recognize and record the amount of laughter and smiles produced by a person [28] 29]. In fact, personal emotions can be used for product measurement. When tastes use the product, the footprints of happiness [30][31], for example, Dopamine[32], are measured through their experience with sensors, equipment [33], or just a questionnaire [34] . The element of happiness is also required by the user and has made its database according to the information entered [35] [36]. The data base is taken from the user through the history of data that has been entered such as: user blood pressure, heart rate, laugh, body temperature [37] [38] [39] . So all the information is combined and then can know and determine the level of happiness which is a quite challenging task[40] [41]

1.1.2 Health

For people or products: The index includes toxic substances in products or substances secreted by the human body [42] [43] [45] 46]. For health elements have medical contributions, usually when users need expert input [23], and then a system will seek and consult with a medical / physician [47][48] [49] Then all the information input from the medical expert is combined and entered into the knowledge database, and the system will provide the information according to the demanded requirements appropriately [50].

1.1.3 Care

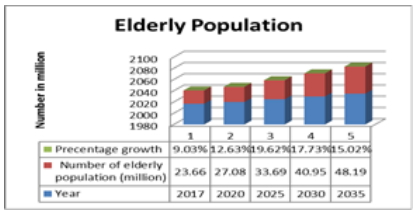
Orange Transform: Any production or non-orange design can be converted to orange computing as long as it adds three orange computing factors, including the characteristic of happiness, health and care, into the process or itself. Furthermore, all characteristics must be higher than the specified threshold. Element treatment / warming treatment [1] [3] [5] is an element that has an important role in orange computing [6] [8] [9] [11] [12] [13] [14] [16] [20] [27]because of the many questions will be who the user [30] [31], how the user get a fast response[33] [34] [35] [36] [39] [40]and when the response is received by the user appropriately in order to require a system of understanding that sematic[41][42] [45] and

accurate which is part of Human interaction - computer (Human Computer Interaction) [46]. Real examples of element Care such as: charitable donations[48]; social workers[49]; retirement home [51] [52] [53]and these examples can be selected in an element of Care.

2. Healthcare of Elderly people

Based on SUSENAS data in 2019, the development of the elderly in Indonesia has developed quite significantly, namely in 2017 there were 23.66 million elderly people and it is predicted that in 2025 there will be 33.69 million elderly people so that currently there are many developments from smart homes carried out by researchers and this scope continues to grow to date, including the development of assistive technology used in Smart Houses. Based on population projection data, it is estimated that in 2017 there were 23.66 million seniors in Indonesia (9.03%). The number of elderly population is estimated in 2020 (27.08 million), 2025 (33.69 million), 2030 (40.95 million) and 2035 (48.19 million) [11] [12]. A country is said to be an old structure if it has an elderly population of more than seven percent (Soeweno). The figure below shows the percentage of elderly people in Indonesia in 2017 has reached 9.03% of the total population.

Table 2. Growth of Elderly people population



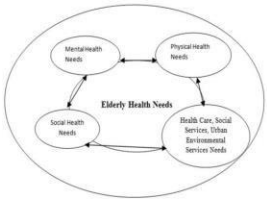
Source : Central Bureau of Statistics, SUSENAS 2017

Products and services based on assistive technology, such as ICT are growing rapidly, and are widely used by part of the population, including the elderly. More and more people aged 55-74 are adapting to use the internet, cell phones, tablets and gaming technology [13]. For many people, it is possible to extend the time of stay at home and at the same time feel safe. Monitoring and treatment of chronic disease can be of a higher quality and more continuous. In addition, rehabilitation and many health and social care services are acceptable in the home environment[14]. The Australian Academy of Science and Engineering Technology notes that many technologies are currently in existence or are in development to facilitate health assessment [15], diagnosis, treatment, independent living and health promotion. Orange computing is available for increased safety, security and surveillance[16]. Despite the large investment by government and industrial partners to design these technologies, they translated it for use by Older Indonesians may have been fragmented and absorption was still low[17]. Roll of the National Broadband Network offers a unique opportunity to connect Indonesians with cutting-edge technology with the potential to improve health, well-being and quality of life[18]. The National Broadband Network combined with other orange computing can be better used by health care institutions, such as district nursing services, general practitioners, and related health professionals to work more effectively and efficiently in homes and communities, to better enable health and well-being[19][20].

3. Related Work

The necessary health care can also be provided outside the home while people are in transition. Tracking technology can provide older people, including those with chronic illnesses such as dementia, arthritis and coronary conditions, safety and freedom to move outside their homes[21]. The Internet can support and strengthen the possibilities for elders to participate in society[22], communicate with the health care system, and access social arenas. Assistive technologies, such as those used in "need" [23] and tracking solutions, can reduce pressure on caregivers and support their caring work[24]. Administrative technology can assist healthcare personnel in carrying out more focused work]25], where more time can be dedicated to direct patient contact and health-related tasks[26]. The concept of orange technology originates from health informatics, and contains two research topics: one is physiological care and the other is psychological care[27]. Both of the two topics focus on improving human physical and mental health, enriching positive emotions and ultimately bringing more happiness to others[28][29]. The physiological and psychological care models of orange computation are similar to the health models in expert medical systems[30], which have been well developed and are commonly used in health informatics for decades[31].

Table 3 The conceptual framework of the elderly health need

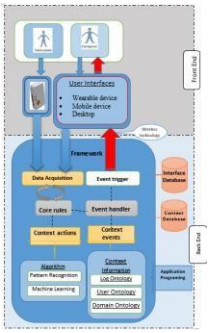


Source : Nastaran keshavarn mohamadi (2017)

The advantages of previous research on the proposed conceptual framework:

Context information; including measuring the effectiveness of the framework in perceiving the context and anticipating the effects of user requests. Measure the accuracy of monitoring, measuring, modeling when the framework responds to user actions (this will evaluate the performance of event handlers, core rules, context actions and context events). The weakness of this concept is that there is no emergency response to other parties if the elderly experience an emergency and can see at table 4

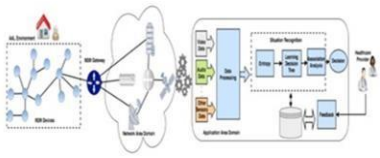
Table 4. Intelligent assistive frame work for monitoring elderly



Source : Babak Ziyae(2016)

In this framework, several components are used to perform user data processing and feedback situations. Data. The Data Processing Unit processes multimodal data streams of various types of data collected from the environment. Situation Recognition contains a model for recognizing activities. Based on the recognition of the situation, the system can make decisions. The final component is Feedback, which enables the health care provider to respond to the system in all unrecognized situations.

Table 5. Concept surveillance of elderly at home

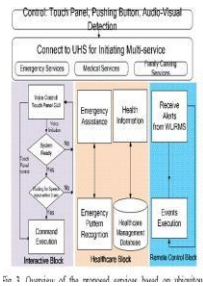


Source : Quin Jin (2016)

Weaknesses: in this framework there is no health monitoring (surveillance) if the elderly are experiencing changes so that other parties in the outside environment can anticipate the situation can see at Table 5.

In the research framework propose service based on ubiquitous, three blocks are composed in a framework, including, Interactive block, Health Service block and remote control block. Interactive blocks combine several existing audio-visual applications; including speech recognition, voice recognition, speaker identification, face identification, laugh detection, voice source estimation, text to speech (TTS) and event recognition. Interactive Block describes two types of user interfaces, including talk control interface and touch panel control interface. In this block, the interactive capabilities are controlled by the MICS and the device is capable of transferring data from sensors and displaying feedback for the user.

Table 6. Overview of propose service based on ubiquitous



Source : Joohyun Han (2006)

This research has weakness is still web-based so it cannot be practical in use and does not have the ability to serve many elderly people at home.

3. Result and discussion

The result method using comparison of several iterative such as :

3.1 Healthcare concept design analysis

Based on a several concept design, it can be defined that concept orange computing of assistive healthcare has 7 concepts for the elderly people, namely: Scalability, low cost, sensor, monitoring, wireless, GPS and installation and maintenance facilities maintain assistive to support health, safety and independence. Regarding 7 concepts researcher propose 2 parts namely: Wearable unit and Non-physical unit. The discussion is as follows:

3.1.1 Wearable Unit

The unit that can be used is a tool used by the elderly in the house. Components included in the wearable unit that is: Sensor, Wireless and GPS as follows:

3.1.2 Sensor

Sensors are implemented in Smart House to monitor occupant safety and provide various services. Environmental sensors are used to detect interactions between users and objects to help recognize human everyday activities [4][6][9] [12][13] These include sensors embedded in beds, chairs, kitchen utensils, etc [20] [27]. Motion sensors detect motion and comprise optical sensors, microwaves, infrared, acoustics, bracelet, etc [34] [41] [45] [46]. Motion sensors can be seen as applications that can provide peace for the inhabitants, and generally do not disturb the occupants[48] [53].

3.1.3 Wireless

A wireless motion sensor network is also used, where some of them are coupled with a contact sensor on the door. The infrared wireless coverage sensor is used in the Home Monitoring System (IMS) [5] [8] [14]. This motion sensor can be used in Smart House for safety detection and falls for adults, user tracking, and behavioral pattern analysis [16] [30] [39]. The infrared motion sensor is used to record the movement of the occupants[42] [51] . This infrared sensor is placed in all rooms in smart home. Magnetic contact sensors are also placed in the door to "track the flow of visitors" or to track if someone is home.

3.1.4 GPS(Global Positioning System)

Home-installed technology is self-sufficient positions Users have different types of devices for home automation and home control [11], such as:

1) Automatic kitchen appliances;

2) Lamp and door control;

3) Indoor temperature controller;

4) Water temperature controller;

5) Home security device.

Please note that automatic kitchen appliances include washing machines, programmable electric ovens, dishwashers, etc [21] [36]. In cases where the device is manipulated by older people[40] [52], an appropriate interface should be provided.

3.2 Non – Physical

Non-physical components are needed non-material such as: Monitoring, Scalability, Low cost and easiness of maintenance. Therefore, these components are indicators that are

needed so that the elements of happiness and health are obtained by the elderly who live in their homes.

3.2.1 Scalability

Scalability is indicator of the device / system used to measure a person's ability level[1] [10] [18], especially for the elderly [24] [26]who can help carry out daily activities at home so that these components become part of the smart home [50] [54].

3.2.3 Monitoring

Smart homes are equipped with equipment for home remote monitoring (such as room temperature monitoring, room humidity, and smoke detection) [2][19][23][25] and very important physical conditions such as heart rate, body condition, blood pressure as well as room oxygen pressure and occupant activity[28][31] [33] . Thus, it can be known and monitored physiologically [35]by others and this component is very helpful for elderly [49]to receive assistance if needed.

3.2.4 Low Cost

The use of smart homes at low cost [7] [17] [22]can allow elderly to live comfortably rather than using expensive and limited health facilities, and this is a component they have to provide a comfortable home for the elderly people[32] [37][38] .

3.2.5 Easiness of installation and maintenance

Smart homes for the elderly people should be designed to meet the criteria of one of its components [3] [15] [29]: the level installed in the smart house has the installation facilities and also the necessary maintenance [43]so that the machine can help the residents according to your needs and the smart house destination can be achieved to provide a home comfortable[44] [47], healthy and self-sufficient that also meet the health, care and happiness features of the orange technology.

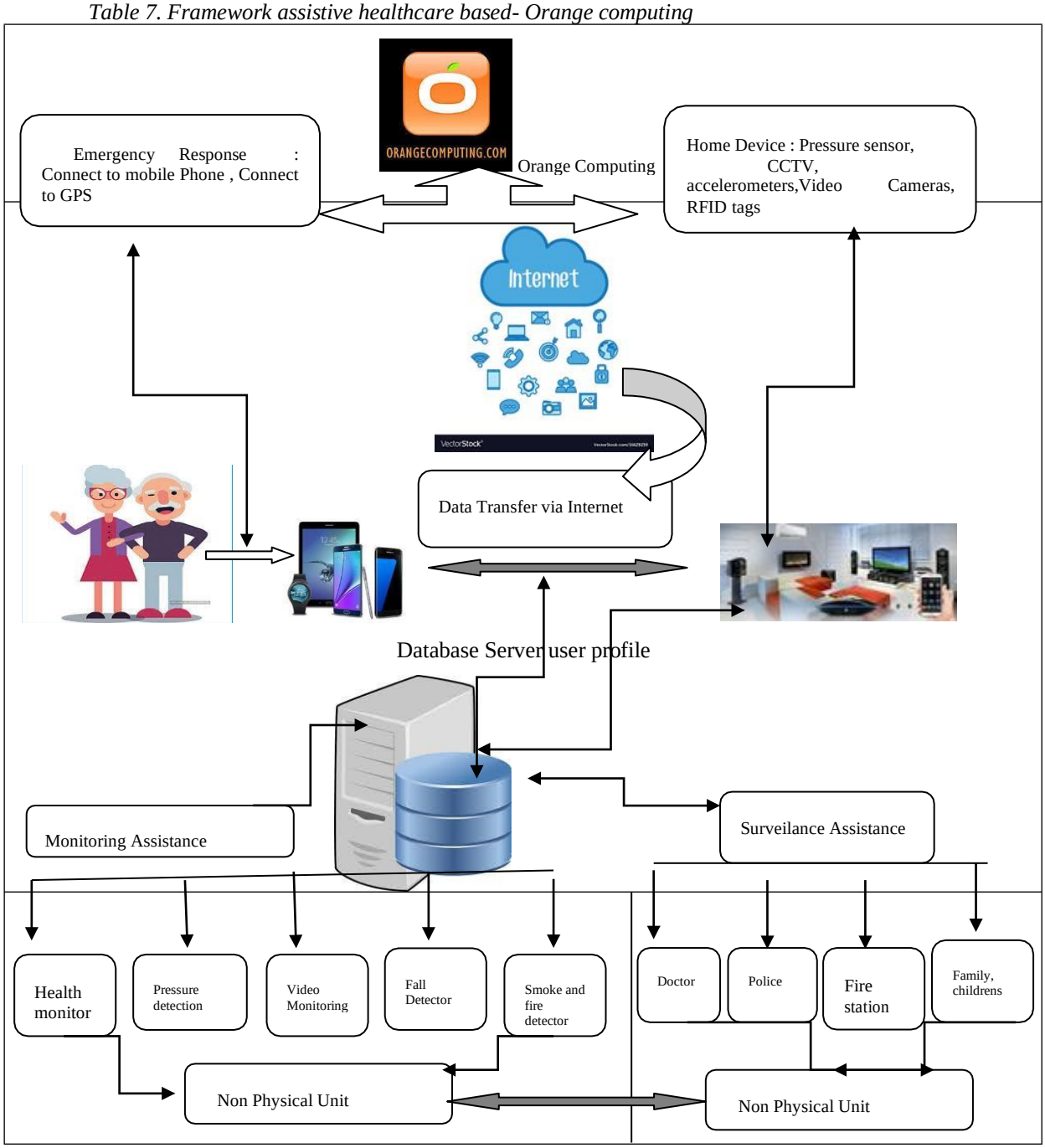
Following the above review literature, a proposed framework for assistive healthcare concepts are composed of two parts: Non-physical and Wearable units. Components included in the Wearable unit: (Sensor, Wireless, GPS). The unit / tool used are used to collect information on the movement and activity of human subjects. The unit used is to collect information about physiological activities and the body through sensors and wireless. The data from the environment and the GPS used are processed by the home gateway where pre-processing, indoor localization through a collection of server databases and the results of the activity recognition algorithms that have been implemented. Physiological data sent comprehensively with contextual information is then sent to a private website for storing and locating local and remote access.

Meanwhile, non-physical components of the results obtained from the tool (Wearable unit) is sent to the personal website as a way to monitor physically occurring in the house, and also this technology used as scalability measurement of health from day to day. Constraints that often occur that a technology is created at a price that is not affordable by people in need so that the technology cannot be used directly by the intended target. Orange technology has the elements of creating happiness and health monitoring. And the components that are not

less important in the non-physical namely the ease of maintenance so that the tools are installed or used easy to repair.

3.2 Framework Assistive healthcare-based Orange computing

Table 7. Framework assistive healthcare based- Orange computing



3.2.1 Monitoring Assistance and Surveillance Assistance

3.2.1.1 Health Monitor - Doctor

The health monitor is the same shape as a digital watch and is also worn on the wrist continuously to monitor pulse, skin temperature and movements performed. For the first seven days, it is used to construct the user pattern and any errors from that pattern form an alarm. digital watches are designed to detect collapses, blackouts, power outages, or any event that affects the factors or variables being monitored. The alarm is transmitted via a radio link to a small device called a multi-link, which is fed into a community alarm system to generate emergency calls at alarm centres such as to hospitals (doctors), and to immediate family members. This device can be used to monitor a person's general health and may be useful as a monitor as well as a wandering detection system because whenever the wearer is outside the range of a multi-link radio around a 50km radius, an alarm will sound. this system may be useful as a warning mechanism for people with serious illnesses such as terminal carcinoma and live-in relatives or caregivers.

3.2.1.2 Pressure detection – Police and Fire station

A pressure detector is an electro-mechanical device that detects a person moving from a bed or chair. This device provides an automatic communication link between the user and the police, doctors or their families (children, etc.). The monitor consists of two variables: a pressure sensing panel, which is located under the mattress or seat cushion, and the control unit, which is placed in a comfortable position for surveillance assistance. Pressure changes are identified when the parent moves from the bed or chair in any direction. The database is detected by the control unit, which provides audible and visual alarms. The monitor is pre-calibrated for different variations in weight, agility and bed types and does not require adjustments in general use. However, the control unit has simple adjustments to make it more or less sensitive. The monitor only identifies the movements that indicate that the person is

have gotten out of bed or chair. The device can be used as a standalone aid or can be linked to existing nurse on call or radio-paging equipment. The household has several applications: (i) as a means of communication between vulnerable communities and surveillance assistance,
(ii) to produce a good profile by being aware of night travel and

(iii) as a fall prevention measure by reminding caregivers of one's movements.

3 similar pressure monitors (weight detectors) are installed under the foot of the bed or under the bedside mat and raise an alarm when the person has been out of bed for a predetermined variable period. This is useful at night, especially if a caregiver or relative is staying at home. They are useful for detecting night odyssey, for preventing falls and for establishing a travel or mobility profile. This pressure mat can be connected to a lighting system: the illumination increases when the elderly arrives.

3.2.1.3 Video Monitoring – Family

Currently, developments in communication processor design, video and audio compression algorithms, network protocols and cost effective production can provide real-time color audio-video communication over ordinary telephone lines. This device is designed primarily for remote surveillance assistance in the security industry, but can be adapted for domestic audio-video communications requiring access to a touch-tone telephone. The video can be viewed on a monitor or domestic television. A computer is required at both ends. A video cassette tape-sized and shaped monitor, a master transceiver, is required at each end and is

connected to a standard telephone line and up to three cameras. Depending on the number of cameras on the patient's end, relatives can use the remote selection control facility to scan the accommodation and determine the patient's location (did they fall? Were they on the floor?). The camera has the ability to pan, tilt and zoom electronically. The system is compatible with and can be linked to other alarms, so fire alarms, for example, can make video calls to relatives who can see and assess the situation and ask for help. A different video monitoring system is available, using a normal telephone line or r3DTh (high speed telephone line), which provides better audio-video communication. The system includes a personal identification number security that allows high privacy.

3.2.1.4 Fall Detector – Doctor and Family

This device is a small device designed to be worn around the waist or upper chest. Most seniors use two-stage detection mechanisms - accelerometers and tilt gauges - to reduce the number of false alarms. The accelerometer detects impacts that are greater than a certain threshold, indicating the minimum impact that will be detected. The tilt gauge determines the orientation of the wearer.

3.2.1.5 Smoke and fire detector – Fire station

This detectors react to visible and invisible aerosol fires (combustion products) and are therefore able to detect the presence of flames early, using either an optical or ionization detector. At the fire alarm this tool measures absolute temperature and the rate of change in temperature. They are suitable for areas where smoke detectors are not suitable due to environmental conditions (smoke, dust, etc.). They are used for those who are at risk of starting a fire at home - such as smokers and people who cook themselves.

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LEMBAGA PENELITIAN DAN PENGABDIAN MASYARAKAT
UNIVERSITAS BINA SARANA INFORMATIKA
Alamat : Jl. Kramat Raya No. 98, Senen, Jakarta Pusat 10450.
Telp. (021) 23231170, Fax (021) 21236158, Ext. 704, 705, e-mail: lppm@bsi.ac.id

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