

The Use of “Smart Shoes” To Increase Barrier Awareness in Blind Person

Rianti Novtasari^{1, a)}, Ratna Tri Utami^{2, b)}, Dela Devita^{3, c)}, Alfiandy Warih Handoyo^{4, d)}

^{1, 2, 3} Universitas Muhammadiyah Lampung

(Jl. ZA. Pagar Alam, Labuhan, Labuhan Ratu, Kec. Kedaton, Kota Bandar Lampung, Lampung 35132).

⁴Universitas Sultan Ageng Tirtayasa

Jl. Raya Palka No.Km 3, Panancangan, Kec. Cipocok Jaya, Kabupaten Serang, Banten 42124

^a riantinovtasari15@gmail.com, ^b ratnatriutami020690@gmail.com, ^c deladevita02@gmail.com

^d alfiandywh@untirta.ac.id

Corresponding author: ratnatriutami020690@gmail.com

Abstract. This study discusses the application of "smart shoes" to detect obstacles encountered by the blind person on the road. These shoes are designed according to the needs of blind person by adding sensors to the shoes to increase alertness. The barriers that usually found in the road are slippery road, potholes, uphill and downhill road. This barriers cannot detect by the blind person, so that we made this shoes to help them can identify these barriers. Smart shoes was design comfortable to wear for blind person as they needs. In first design smart shoes was thick, after redesigning smart shoes was more thin and water resistant so that blind person can easy to walk. In this research to develop smart shoes, we decided to use research and development and with ADDIE design. The results of this study are that the application of "smart shoes" to increase awareness of blind person against obstacles on the road increases, based on 8 of respondents. Besides that, smart shoes are highly recommended to be an alternative for blind person in walking in addition to using a white cane.

Keywords: Awareness, Blind Person, Smart Shoes

INTRODUCTION

Mobility in blind person is a very important thing to be developed in their lives. It is intended to carry out their daily activities independently.

Mobility in general is also related to the environmental conditions, because mobility is the movement from one place to another. This is also explained by mobility as the ability, readiness and ease of movement, as well as moving places (1). The importance of expertise in mobility can increase the confidence of the blind in moving from place to place, because in moving places there are things that sometimes pose a threat to the blind when they move. The threats can be in the form of potholes, slippery roads, climbs and descents. If all of this is not recognized by the blind, then this can endanger the blind themselves. These existing obstacles cannot be circumvented because not all roads in every area provide accessibility.

Suraman in (2) reveals that accessibility in particular in public services is related to how easily public services can be accessed and used by many people. In line, the definition of accessibility according to Black in Miro (2009) is a concept that combines geographic land use systems with transportation network systems where land use changes, which cause geographical zones and distances in the area. An area or city, will be easily connected by the provision of transportation infrastructure or facilities.

According to (3) accessibility is the convenience provided for the disabled in realizing equal opportunities in all aspects of life and livelihood, as an ease of moving through and using buildings and the environment by paying attention to smoothness and feasibility, which is related to circulation, visual and setting components.

The available accessibility has indeed been promoted by the government by issuing the Regulation of the Minister of Public Works Number 30/PRT/M/2006 concerning Technical Guidelines for Facilities and Accessibility

in Buildings and the Environment which regulates appropriate facilities and accessibility for persons with disabilities (4).

The building in question is a building that can provide safety, convenience, usability and independence for users, so that it is not only for non-disabled people, but also for people with disabilities. Accessibility that has been provided such as the provision of special roads for the blind, handrails, provision of white canes in schools, procurement and reproduction of braille books and so on. It's just that the accessibility provided has not been optimally utilized by blind person so that the existing obstacles cannot be optimally minimized.

The obstacles experienced by blind person are indeed quite complex, which occur due to a lack or absence of vision. This obstacle is also a serious problem for them, because in essence the sense of sight captures more information than other senses possessed by humans. Regarding the above conditions and the limited exploration of the environment due to incomplete information acquisition, a blind person has difficulty in mobility.

The existing accessibility does not actually meet the needs of the complete mobility of the blind, new developments and innovations are still needed to support the feasibility of living for blind person. For example, a white cane, almost all blind people already have it, but for use it still has drawbacks, for example unable to detect in detail the obstacles that exist. Therefore, there are other additional alternatives that can be used either to accompany the white cane or can be used alone to detect obstacles or dangers when the blind walk. Another alternative that is offered in this study is a shoe that can detect various threats on the road, whether it is potholes, there are objects that block, uphill roads and downhill roads. These shoes are designed by using sensors that are arranged in the shoe that will vibrate if it encounters certain obstacles. These shoes will detect obstacles within one meter so that blind person can be careful and alert on the road. This shoes is named "Smart Shoes". This one designed based on the results of the assessment and profile analysis of blind students so that it is found that they need a device to detect obstacles that will be encountered on the road. Smart shoes is a product of assistive technology. Assistive technology is all kinds of modified tools or applications that are able to provide convenience and accessibility for children with special needs. (5).

According to Assistance for Persons with Disabilities Act (1990) Amerika Serikat "...assistive technology devices...are any item, place of equipment or product system, whether acquired commercially of the shelf modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities ."

Then, Wobschall dan Lakin at.al (6) said that "...assistive technology is just a subset of tools used by human being, providing in ways and places that are needed by relatively few people with significant impairment in 'normal' physical, sensory, or cognitive abilities." With assistive technology, smart shoes can be designed according to the needs of the blind person (7,8).

This type of research used research and development where this research data was used ADDIE design. Form of data was words, schemes, pictures and numbers. Gorman & Clayton (9) that this research method is to report the meaning of events from what is observed by researchers. At the report stage, it contains observations of various events and interactions that are observed directly by researchers from the scene (9). Descriptive research is included in the type of qualitative approach that can describe a situation or existing phenomena.

The design of this study was an ADDIE design that used an analysis approach of interviews, observations, trials and conducted FGD. Respondents in this research were 7 of blind person from special school and one student of Universitas Muhammadiyah Lampung, totally there were 8 of respondents.

METHODS

Qualitative data were obtained from interview guides with research subjects of blind students, observation guidelines were also carried out when conducting needs analysis on the mobility of blind students and conducting trials and fgds when the tools could be used to see the capabilities of the designed tools. Data collection techniques in this study were used to analyze obtained from observations, interviews, trials and fgds. Data analysis techniques in this study were carried out by several techniques including data reduction, data presentation, verification/drawing conclusions and data collection. The validity of this research data will be known through the triangulation method.

(10) triangulation method is a data collection technique that combines various techniques and data sources that already exist. In the credibility test, there is triangulation of sources, triangulation of data collection techniques, and triangulation of time and also tested through fgds through several expert resource persons in designing "smart shoes" tools.

RESULTS AND DISCUSSION

The manufacture and development of "smart shoes" is carried out on the basis of the mobility needs of the blind in the field. Obstacles when moving places become a challenge for blind person, especially when they have to travel to an area or road that has never been passed or that has been passed but has not memorized the existing conditions. To assist the mobility of the blind person, a device called "smart shoes" is designed in such a way as to provide services to the blind person. This shoes was developed from Agas Siwi Jalu Pamungkas dan Vicy Azizah Malihah & Damar Triyana product's (2019), but the difference are in durable from water and more thin. For more research, in Latifah et.all (none), they made a shoes named (SULTAN), the differences are in shape of shoes more thick, that shoes only can detect from wall, empashized to distance and detect the position.

Smart shoes are made with various features that make it easier for blind person to recognize obstacles on the road, such as potholes, slippery roads, uphill roads and downhill roads. The features in smart shoes work according to their respective functions. The way it works is that this shoes has sensor that can detect obstacles within one meter of where the visually impaired are by connecting the sensor to an audible warning that appears from inside the shoe. This sensor will automatically sound if it encounters these obstacles.

At the beginning of the design, Smart Shoes was still constrained by the high sole of the shoe which made it difficult for the blind to walk, this was due to the large number of cables and tools that were inserted in the shoe, then the shoe material used was not waterproof so that when it came into contact with water on the road will have an impact on turning off the currents in the shoe so that the sensor cannot function properly. This was obtained after being tested on blind students when they were asked to walk indoors and outdoors. From the results of these trials, the research team decided to redesign the shoes by changing the shoe material into leather shoes and looking for tools and materials that are light and thin so as not to make the shoes thick.

After redesigning, the shoes were re-tested on blind students who explained that the shoe designs were quite easy to use and did not make it difficult to walk anymore. The student also recommended that shoes be distributed more widely in the future.

The trials that have been carried out on research subjects, so these "smart shoes" must also be reviewed from the perspective of experts, namely through FGD activities. FGDs were conducted on 6 experts and several visually impaired individuals who were present, the result of which was that there was an improvement in the shoes, namely that the sound sensor should be able to catch the signals of obstacles more quickly and the price offered to get the shoes was lowered. According to the experts who attended the FGD, these shoes cannot replace the white cane commonly used by blind person, but can be an alternative, for example being a supporting companion on a white cane.

CONCLUSION

Smart shoes are one of the alternatives offered to assist the mobility of blind person to identify obstacles encountered on the road or in a place to avoid danger. Smart shoes are developed based on an analysis of needs in the field and adapted to the features installed in the shoes. These shoes have sensors that will pick up the obstacle signal and accumulate it by vibrating, so that blind person can be aware of the danger ahead.

During the trial, visually impaired individuals felt that they were more careful when walking.

Here is the difference first design and after redesigning:



Picture 1



Picture 2

ACKNOWLEDGMENTS

This research was supported by team and blind person that become a subject and KEMDIKBUDRISTEK DIKTI for choosing us to develop this shoes.

REFERENCES