Smart Wheelchair Prototype Based Android As A Tool For People With Disabilities

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ABSTRACT. A smart wheelchair prototype is to make a design tool that is useful for humans, especially in the health sector, namely a smart wheelchair, where this design will be very useful for the wearer. This smart wheelchair is also equipped with advantages in the form of an application in a smartphone that is connected to this smart wheelchair, where in the smartphone there is a "smart wheelchair" application specifically designed to control this smart wheelchair. As is known smartphone is often used to communicate. **Purpose** to help individuals who cannot use a manual wheelchair (manual wheel chair). This smart wheelchair prototype can be driven by using Arduino Uno R3, Buetooth HC 05 and DC motors that use the Smart Wheelchair application. Using the waterfall method which has stages such as Requirements analysis and definition, System and software design, Implementation and unit testing, Integration and system testing, Operation and maintenance. What is obtained is an Android-based wheelchair prototype. Remote control car control application uses a cellphone via Bluetooth communication media that has a right turn, turn left, advance with three levels of speed, reverse, brake, automatically return to the range of Bluetooth cellphone adapters, and automatically stop. then this wheelchair can be used as a tool for persons with disability. Obtained results are prototypes of Android-based smart wheelchairs designed using Bluetooth systems and Arduino.

Keywords: persons with disability, Arduino uno R3, Bluetooth HC-05.

1. Introduction

In this era we often encounter many of us suffer from paralysis, either due to accidents and other things. Patientthe lame cannot do anything without other people's help. Reality that happens a lot between those who use wheelchairs to make it easier their activities. There are also those who are struggling move the wheelchair using their hands so they need someone else's help to do wheelchair activities, in this case for move place [1]. Rapid technological development in the field electronics can help solve problems that we often encounter. This development realized in technology in a wheelchair. Chair the wheel is a motion aid for people with disabilities and people who are in sick condition who need mobility to be able to do daily activities. Usability of a wheelchair in general is to help patients who have the disorder motor system on his feet.

A wheelchair is a tool used by people who have difficulty walking with illness, injury, or disability. When some individuals with limited mobility can be helped with a standard wheelchair, or with other limited mobility, it is difficult or impossible to operate a standard wheelchair [2]. The physically challenged people are having the difficulties in walking due to illness, injury, or disability. The proposed system is easy and efficient to solve the problem of physically challenged people and also it has the best functionality and it is simple and low cost.

Wheelchair provides mobility which does not depend, the ability to participate in society and earn a living. The handicapped person gives their voice to the android mobile, output of the Android mobile is voice command that is converted into text. The output of the mobile is given to the microcontroller and the proposed system movement is controlled using Bluetooth module with the help of DC motors. This proposed system has battery powered wheelchair with DC motors. Also an ultrasonic sensor is used to detect the obstacle [3].

The method used in wheelchairs is currently ineffective in terms of both usage and features. To anticipate these problems, many smart wheelchair technologies have been developed, such as wheelchairs that are driven using sound [1]. or head movements [4][5]. But from studies that have been there, there is no solution to the problem regarding monitoring the user's health, condition, and wheelchair location. For monitoring the user's health, currently it is still manual and separate from a wheelchair. Research on existing health monitoring is an Android-based pulse detection [6]

The main focus of this project or application is to facilitate and increase the mobility of handicapped and old aged people who are not able to move well because of their disabilities of organs. Using this wheel chair will allow handicapped people to live a life independently without depending on others for their movement as a daily need. Speech recognition technology is a key technology which will provide a new way of human interaction with machine or tools. Therefore the problems that they face can be solved by using speech recognition technology for the movement wheel chair. This can be realized and optimized with use the smart phone device as an intermediary or interface. In this project interfaces has been designed therefore to develop a program for recognize speech also controls the movement of chair and an application which can handle or manage the graphical commands. This project uses arduino kit Microcontroller circuit and DC motors to create the movement of wheel chair and IR Sensors to detect the hurdles in between wheelchair and the way of direction [7].

Android technology is a key which may provide a new approach of human interaction with machines or tools. Thus their problem can be solved by using android technology to control the movement of a wheelchair. In this paper, Bluetooth controlled android application is designed to program the android device that will be able to control the movement of wheelchair. A wheelchair monitored with the Android mobile application to control the application is developed to help the disabled patients by using application to control the movement of wheelchair in different direction. The main advantage is to design a wheelchair that will controlled wirelessly and will be very easy to operate it with no physical efforts. This paper will help to disabled [8]

2. Proposed Model

The main purpose of this smart wheelchair is to help individuals who cannot use a manual wheelchair. This smart wheelchair is inspired by patients who often use manual wheelchairs and because of the emergence of a sense of caring and a strong desire to make a wheelchair that is more effective and innovative in its use. The advantage of this smart wheelchair design is that it can be driven using a motor, sensor, and navigation system. In addition to the reference point the wheelchair moves automatically according to the commands given. A wheelchair can run automatically because a wheelchair is set to have an imaginary path that is connected to each room. Control of wheelchair movements is regulating the speed of the wheels which are generally driven by DC motors. The wheel speed regulation is regulated by using Proportional Control so that the output has a good response to the input. Practically, the DC motor used cannot be considered ideal, such as the existence of friction and power losses.

Therefore, so that the wheels of the robot can move at the expected speed, it is necessary to feedback the speed of the robot wheels to the expected reference which then the difference will be processed by the feedback system. This smart wheelchair is also equipped with advantages in the form of an application in a smartphone that is connected to this smart wheelchair, where inside the smartphone there is an application "Smart Wheelchair" specifically designed to be able to control this smart wheelchair. As you know, smartphones are often used to communicate.

3. System Design

The system design of this tool is divided into two parts, namely: hardware design and software design. The hardware design that will be used in the implementation of this tool includes the design of a minimum microcontroller circuit, Bluetooth HC-05 module, H-bridge circuit as a DC motor driver, power supply, and DC motor as the drive of this smart wheelchair. While the software is an Android-based smart wheelchair prototype using the smart wheelchair application.

At this stage here we also use the waterfall method according to [9] This waterfall method has the following stages:
1. Requirements analysis and definition
   System services, constraints, and goals are determined by the results of consultations with users who are then defined in detail and function as system specifications.
2. System and software design
   The stages of system design allocate system requirements both hardware and software by forming the overall system architecture. Software design involves identifying and describing the software system's basic abstraction and its relationships.
3. Implementation and unit testing
   At this stage, software design is realized as a series of programs or program units.
4. Integration and system testing
   The individual units of the program or program combined are tested as a complete system to ascertain whether they fit the software requirements or not.
5. Operation and maintenance
   This stage is the longest stage, the system is installed and used significantly.

4. Results and Discussion

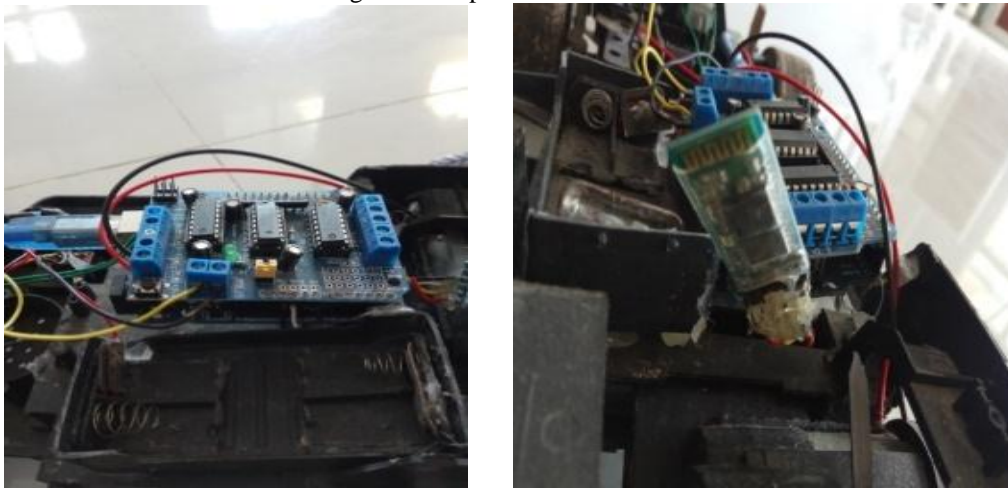Fig. 1 Prototipe Kursi Roda Pintar

fig. 2 *H-Bridge Motor Driver dan Bluetooth HC-05*

Fig 3 aplikasi *smart android wheelchair*

Figure 1 is the result obtained, an Android-based wheelchair prototype. The remote control car control application uses a cellphone via Bluetooth communication media that has half right and full turn movements, turn half left and full, move forward with three levels of speed, reverse, brake, automatically return to the range of the Bluetooth mobile adapter, and

automatically stop when unable to back. then this wheelchair can be used as a tool for patients who are paralyzed without the help of others.

Picture. 2 H-Bridge motor driver and Bluetooth HC-05 ie To start using the smart wheelchair application, a user must run the Android "Smart Wheelchair" Android application on a pairing of HC 05 Bluetooth and Arduino Uno R3 smartphones from their Android smartphone with the HC 05 Bluetooth module in a smart wheelchair. Furthermore, users can operate the smart wheelchair application by clicking on the "forward", "backward", "left" and "right" navigation to move the smart wheelchair, thus helping to ease the mobilization of walking that is more effective, innovative in its use.

At this stage we make the design of the application design before making the application, in making the application design we exchange opinions to produce an attractive design. At this stage we also need the help of expert experts. The next stage is making the application requires expert experts to make it. Which makes the design flow of the application with a flowchart, the interface design uses an storyboard and implements the design using the programming language. From the design of application designs that we have previously made try to produce actual applications.

Picture. 3 smart wheel chair applications namely in making applications that can be run using a sublime text editor is an application editor for code and text that can run on various operating system platforms using Python API technology. The creation of this application inspired by this application is very flexible and powerful. The functionality of this application can be developed using sublime-packages. Sublime text is not an open source application, which means this application requires a license (license) that must be purchased. However, some of the functionality development features (packages) of this application are the result of the findings and have full support from the community and have a free application license [10]

The initial design results of this smart wheelchair can be driven by using a motor, sensor and navigation system. In addition to the reference point the wheelchair moves automatically according to the commands given. A wheelchair can run automatically because a wheelchair is set to have an imaginary path that is connected to each room. Control of wheelchair movements is basically regulating the speed of the wheels which are generally driven by DC motors.

People use their smartphones to do social tasks such as calling, sending messages, listening to music and sending e-mails and other files. Now days smartphone is not only used to speak the purpose of many other works based on smartphones such as web browsers, games, and online videos. Once with the help of this smartphone user can direct the chair in four different directions. Wheelchairs can move in different modes. Touch mode, the mode as a touch screen is available on every smartphone so it's easy for users to use it. On the touch panel four different quadrants are given left, right, forward, and backward. The user only needs to move his finger across the quadrant to choose the direction the wheelchair will move [11]

With this design, hopefully it can help individuals who cannot use a manual wheel chair. Where the wheelchair is able to move in accordance with the wishes of the patient just by pressing the buttons provided, for example forward, backward, spinning and others. With the application of the system above, this wheelchair can be used as a tool for patients who are paralyzed without the help of others. In this case, we were inspired to make a design tool that is useful for humans, especially in the field of health, which is a smart wheelchair, where this design will be very useful for the wearer.

5. Conclusion

Prototype of an Android-based wheelchair with a remote control car application using a mobile phone via Bluetooth communication media that has right turn, left turn, move forward with three levels of speed, reverse, brake, automatically return to the range of the Bluetooth mobile adapter, and stop automatically. then this wheelchair can be used as a tool for people with disabilities.

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7. References

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