UOS SMART E-WHEELCHAIR

(Project Proposal)

Project Code

Project code assigned by the Project Office	

Project Advisor

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1. Abstract

The aim of introducing Smart E-wheelchairs is to facilitate elderlies and physically disabled people. Physically Disable people face problems while going from one place to another place. Wheelchair is one of the most commonly used supporting devices to uphold mobility and enhance quality of life for people who have difficulties in walking.Wheelchair provides the user the freedom to move around, allowing the user to perform day to day physical activity. If a disabled person uses simple wheelchair than he/she needs an attendant who helps them to perform the activity. Smart E-wheelchairs is a ride solution to solve the problem faced by disable people. It allows the user to get around and undertake daily activities without assistance. It makes a disabled people independent. They will simply have to install an application on their cell phones and fill an application to get wheelchairs services. By using android smartphone, the user can select the specified direction displayed within the four quadrants on the screen of the android smartphone to control the wheelchair. An Arduino Uno is basically used to execute all commands. Moreover, MD30C motor driver and HC05 Bluetooth module are used in this system. This system is mainly designed to save time and energy of the user.

2. Background and Justification a. Background

i. The first known wheelchair purposefully designed for disability and mobility was called an “invalid’s chair”. It was originated in 1595 specifically for King Phillip II of Spain. [1]

ii. In 1783, John Dawson of Bath, England invented a wheelchair and named it after his town. The Bath wheelchair had two large wheels in the back and one small one in the front. [2]

iii. In 1869 a patent was taken out on a wheelchair that could be self-propelled and had large wheels at the back. Wheelchairs were starting to get less bulky but still were not easily transportable [2]

iv. In 1932 the folding tubular steel version of wheelchair was made by Harry Jennings[2]

v. Electric-powered wheelchairs were invented by George Klein. It was extremely expensive. [1]

b. Justification

Due to the increased percentage of elderlies and physically disabled people, wheelchairs are the best assistive devices to help them enhance their personal mobility. The conventional wheelchairs have some limitations such as flexibility, bulkiness and restricted functions. There are existing technologies which allow the users to use human gestures such as the movements of hands, movements of leg tongue and head and synchronize them with the movement of the wheelchair. Smartwheelchair App is a better wheelchair controller..A smart wheelchair is developed to help an elderly or physically disabled person (user) to move from one place to another independently. To control Smartwheelchair, you need to install the application in your smartphones.

By using smartphone, the user can easily determine the wheelchair's movement by selecting the desired direction on the android smartphone phone screen. The command given by the user will be forwarded to the Arduino Uno via Bluetooth. The Bluetooth will convert the commands given by the user in a binary format and send them to the Arduino Uno. Arduino Uno used in wheelchair will read and execute the command and finally send the digital values to the motor driver device. The motor driver installed will direct the wheelchair according to the command given. . When the user selects the "Go" arrow, the wheelchair will move in a forward direction, "Back" arrow prompts the wheelchair to move backward, and "Left" arrow causes the wheelchair to turn towards left,and"Right" arrow makes the wheelchair to turn right.An aged or physically challenged person can carry on the direction and movement of the wheelchair with the facility of android smartphone in the following four different directions namely, left, right, forward and reverse. There would also be a stop button to make the wheelchair's movement stop at once. The wheelchair will move according to the command given by the user.

In this paper will discuss, a smart wheelchair is developed to help an elder person or

someone who is physically disabled to move from one place to another independently. An elderly or physically challenged person can direct the direction and movement of the wheelchair with the help of the android smartphone in four different directions, left, right, forward, reverse and stop. The wheelchair will move according to the command given by the user.

3. Project Methodology

The project entitled "UOS SMART E-Wheelchairs" is a combination of **IoT** and **Android** base logic. Two phases involved to achieve this project objective.

- **Android-based development phase**

  In this project we make an android application that is used to control the wheelchairs. User will simply have to install an application on their cell phones to apply for wheelchairs. Following step involved in this phase:-

  - Graphical user interface for an application.
  - By using smartphone, user selects the "Go" arrow, the wheelchair will move in a Forward direction, "Back" arrow prompts the wheelchair to move backward, and "Left" arrow causes the wheelchair to turn left, and "Right" arrow makes the wheelchair turn right.
  - Establish a connection between application and chips used in the IoT phase.

- **IoT based development phase**

  In this project, we used two chips. These two chips are also connected with our android application. For coding in chips, we will use Arduino IDE Software. Chips are placed on wheelchair which will perform two functions.

  - One chip will be used for location tracking. The wheelchair will be tracked down through the location chip so that we may know if it is being used inside the university.
  - The second chip will be used to automatically lock the wheelchairs, when not in use.
  - A device is used to control new movement of wheelchairs. By using a user can move his wheelchair in left, right, upward and backward direction.

4. Project Scope

1. Smart E-wheelchair System is a wheelchair sharing system. It aims is to make physically disabled student independent within University of Sargodha.
2. Movement of wheelchair can be controlled by using android application. With the help of this functionality user don’t need any attendant.
3. The electronics wheelchair presents in marketplace are too much costly. A common person cannot afford to buy that wheelchair. The electric wheelchair we are going to make is affordable by a common man.

   He/she is allowed to use the wheelchair only inside the campus area.

Chapter 2

Feasibility Study

1) Technical Feasibility

The technical feasibility of this project involves the languages and Arduino devices which are being used to develop the project. The project entitled "UOS SMART E-WHEELCHAIR" is a combination of IOT and android base development.

- In IOT base development we use Motor driver (L298N), DC motor, HC-05 Bluetooth module, Arduino Uno, Power supply, capacitor, LM7809 and wheelchair. These components will combine to make electric wheelchair. We use Arduino IDE for coding in chips.
- In the android base development phase, we will develop an application that is used to control a wheelchair. For front end coding we use XML language. For back end coding, we use JAVA language. The developmental phase of the application consists of a graphical user interface and movement functionality of the wheelchair using mobile application. Application would provide a user-friendly display, easy to use and operate.

2) Economic Feasibility:

The following factors are considered in designing the proposed solution:

A. Software cost estimation

We can calculate the cost of software by using Constructive Cost Model. Our project is medium level and have characteristics of organic mode so we take value of organic mode for a, b, c and d. There are approximately 3 KLOC in our project.

Mode	A	b	c	D
Organic	2.4	1.05	2.5	0.38
Semi-Detached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

In this we calculate 4 things

i. **Effort**

$$Effort = a\ (KLOC)^{b}\ person\text{-}month$$

$$Effort = 2.4\ (3)^{1.05}\ person\text{-}month$$

$$Effort = 7.60\ person\text{-}month$$

$$Effort = 8\ person\text{-}month$$

ii. **Development time**

$$Development\ time = c\ (Effort)^{d}\ month$$

$$Development\ time = 2.5\ (8)^{0.38}\ month$$

$$Development\ time = 5.49 month$$

$$Development\ time = 5\ month$$

iii. **Average staff size**

$$Average\ staff\ size = (Effort/\ Development\ time)\ person$$

$$Average\ staff\ size = (8/\ 5)\ person$$

$$Average\ staff\ size = 1.6\ person$$

$$Average\ staff\ size = 2\ person$$

iv. **Productivity**

$$Productivity = (KLOC/\ Effort)\ KLOC/\ person\text{-}month$$

$$Productivity = (3/\ 8)\ KLOC/\ person\text{-}month$$

$$Productivity = 0.375\ KLOC/\ person\text{-}month$$

$$Productivity = 0.4\ KLOC/\ person\text{-}month$$

B. Hardware cost estimation

Table 1: Hardware cost

Sr.No	component	Approximately cost
1	Motor driver (L298N)	2000
2	DC motor (350W,24V,2600rpm)	3000
3	Bluetooth module	550
4	Microcontroller	650
5	Power supply	10000
6	Wheelchair	10000
8	Wire	1000
9	Button	500
10	capacitor	500
11	LM7809	600
Total		28800 approximately

3) Legal Feasibility:

Our project follows the rules and regulation of government. This project is entirely under the law of Pakistan. We are not doing such type of activities which violate the laws of Pakistan.