

Smart Wheelchair with SMS Alert and Safety Features

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Abstract— Smart Wheelchair with SMS Alert and Safety Features is an electronic wheelchair, which has been designed to provide mobile independence with security to the differently abled people who suffer from various difficulties on movement in daily life even on using a manual wheelchair. To update it from manual to smart, RC remote has been used so that the wheelchair user can move on any direction just moving the stick of RC remote with one hand, reducing the need of manual force for moving the wheels. To control the system, ATmega328p microcontroller has been used with the added security features. The buzzer directly helps the user to be able to learn about any problem with the surrounding and provide instant aids. Similarly, accelerometer and ultrasonic sensors have been used for making the system safe and trustworthy. GSM module has been used to alert caretaker/family of wheelchair user. The system was well designed with SMS alert and safety features under low-cost.

KEYWORDS: *Smart, Differently Abled, Wheelchair, Mobile Independence, Accelerometer*

I. INTRODUCTION

Every human has right to independent movement. It is a simple statement, but has a great impact on the confidence and self-esteem of a differently abled person. Manual wheelchairs though provide independence in some cases of disability, not all the disabled are able to have movement manually driving the wheels. Thus, there is a strong requirement of electric wheelchairs. Smart Wheelchair with SMS

Alert and Safety Features is an electronic wheelchair. The wheelchair consists of motors attached to wheels that can be controlled by a RC Remote thus providing automated movement without manual force. Once the system is switched on, a patient just needs to use his/her hands to move wherever they want. The wheelchair has some safety features such as obstacle detection by which a user gains the sense of self mobility with security. Similarly, the message alert feature helps a patient to alert his/her family. To ensure the independence in mobility of locomotive disabled, this project is applicable. It reduces the effort for manual pushing of wheels as well as provides safety. It is seen effective for day-to-day movement of the disabled. This makes it more effective than the using of manual wheelchairs. For a developing nation like Nepal where more than 36 % of disabled have lost their mobility, this system is very essential [1]. To provide the disabled a sense of independence and movement as well as to ensure their safety by helping them alert their families when in need, this system is very much suitable.

II. LITERATURE REVIEW

Smart Wheelchair with SMS Alert and Safety Features is an electric wheelchair. The wheelchair consists of motors attached to wheelchair that can be controlled by a RC Remote thus providing movement without manual force. It reduces the effort for manual pushing of wheels as well as provides safety. The wheelchair has some safety features by which a user

E. Discussion

During the research of a smart wheelchair for real time, different methodologies were studied and best feasible method was chosen. In the course of our research, we found that the advance systems used raspberry pi as the microcontroller for better speed and faster processing. We used ATmega328p as microcontroller as our main goal was to achieve the functionality rather than speed being a key factor. Our system consists of SMS alert which is beneficial for the safety of wheelchair user and describes problem in wheelchair orientation. We used wireless communication for the alerting to the caretaker/family of the user. Overall, our research suggests a low-cost control system design which can give independent movement to a wheelchair user.

F. Result Analysis

Based on our research, analysis and the result we got during implementation of the project, overall we achieved a significant level of accuracy. Compared to Leopard, the first smart wheelchair in Nepal, our system can provide more efficiency at a low cost. The accuracy obtained for ultrasonic sensor is presented below:

TABLE IV. ACCURACY OF ULTRASONIC SENSOR

Front ultrasonic sensor(cm)	Back ultrasonic sensor(cm)	Accuracy range > (cm)	Result
25	20	10	No obstacle
20	15	10	No obstacle
6	14	10	Obstacle in front
5	18	10	Obstacle in front
50	2	10	Obstacle in back
50	5	10	Obstacle in back

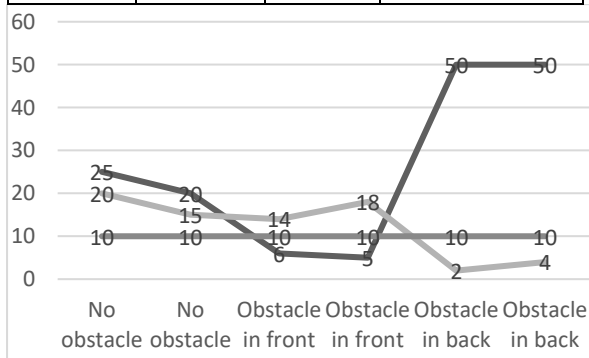


Fig. 12. Performance of Ultrasonic Sensor

Front Back Roll	Side Roll	Front Back Roll (min)	Front Back Roll (max)	Side Roll (min)	Side Roll (max)	Result
90	241.67	75	105	220	280	Normal
91.79	249	75	105	220	280	Normal
85	240	75	105	220	280	Normal
162	260	75	105	220	280	crashed front back
90	300	75	105	220	280	Crashed by side

TABLE V. ACCURACY OF ACCELEROMETER SENSOR

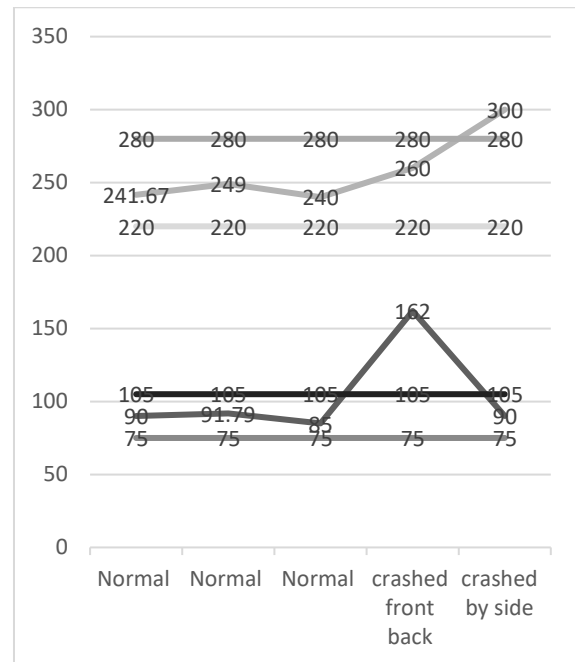


Fig. 13. Performance of Accelerometer Sensor

Motor speed range calculation

The normal speed of the system should be 8 cm/sec but the weighted wheel chair has some more power requirement. There is some loss of power while moving with load. For unloaded condition the vehicle top speed is 8.51 cm/sec, which can be considered good for normal home uses.

V. CONCLUSION

Smart Wheelchair with SMS alert and safety features was successfully tested. Also, the specific objective to design and develop a system that helps people with locomotive disability to have independent movement was fulfilled. The designed wheelchair provides SMS alert on emergency situations. Thus, the low-cost microcontroller and advances in wireless communication inspired us to design and develop the low-cost system. By using this prototype containing microcontroller (ATmega328p), GSM/GPS module (SIM 808) and other components, smart wheelchair

