

# AUTONOMOUS WHEELCHAIR UNDER A PREDEFINED ENVIRONMENT USING STM32F429ZIT6

Anarghya siri R, Pavan kumar P, Prof. Jayadevappa R S, Prof. Nandini G R,  
Prof. Farzana Parveen B A

SRI JAGADGURU MURUGHARAJENDRA INSTITUTE OF TECHNOLOGY CHITRADURGA 577502, KARNATAKA,INDIA  
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

## ABSTRACT

*The present day society demands the people to be independent, irrespective of their natural challenges, mentally or physically. Physically impaired people have to rely on someone for fulfilling their even minor needs. The probability of them to go and interact with the outside world is very minimal, unless they are provided with modern moving tools such as a Wheel Chair. There are two possibilities of either using manual driven or electric powered driven wheel chairs. This project aims to drive a wheelchair by means of switch controlled in a predefined path. It enables the disabled people who can't move legs to move around independently using the switch controlled path recognition application which is interfaced with motors to make the movement easy as much as possible, using a path recognition application which is interfaced with motors.*

**Keywords:** - *Wheelchair, Predefined path, Autonomous system, Sensors, Arduino,*

## 1. INTRODUCTION

The number of people who need to move around with the help of some artificial means, whether through an illness or an accident, is continually increasing. These means have to be increasingly sophisticated, taking advantage of technological evolution, in order to increase the quality of life for these people and facilitate their integration into the working world. In this way a contribution may be made to facilitating movement and to making this increasingly simple and vigorous, so that it becomes similar to that of people who do not suffer deficiencies. Systems already exist which respond to many of the needs of people with different degrees of incapacity. Recently the old person and the physically handicapped person who use a wheelchair are increasing. However, only two types of wheelchairs by the hand-operating and operating the joystick, have come into wide use. The former type needs muscular strength for the operation and the latter type needs the skill. Therefore, there is a problem that it is difficult for the old and the handicapped person to use these interfaces. Today in the biomedical sector, a wheelchair is an important device because of the recent advancements in the industrial populations. The demand of the physically handicapped and the aged are ever rising. As a smart wheelchair will play a significant role in the future welfare society. We are trying to construct an autonomous wheelchair under a predefined path; the system will recognize and follow a predefined path using switch instructions such as "ward1, ward2 etc." The objective of this project is to make a wheelchair moving one ward to another ward, forward, backward, Left & Right with the help of switches in a predefined path. A wheelchair fitted with an obstacle sensor to achieve some independent mobility when any obstacle is there in front of the wheelchair. The obstacle sensor will help the rider control the wheelchair by taking over some of the decision for steering and avoiding objects until the user is able to handle the job. The movement of the powered wheelchair depends on the motor control and drive system which consists of a microcontroller and motor driving. Once the switch is pressed, the system recognizes the pre-defined path in comparison to the stored memory, the respective coded digital signals would be sent to the microcontroller which then controls the wheelchair accordingly.

## 2. PROBLEMS IN CURRENT SCENARIO

Independent mobility is crucial for development of physical, cognitive, communicative and social skill for physically impaired people. The high price of the electric wheelchair. This project is thus aimed at the development of more sophisticated control scheme for electric powered wheelchair. The main problem of the wheelchair is that cannot be used by disabled person, so the type of artificial aid needed by a disabled person in order to move about depends, to a large extent, on the level of his incapacity. so no need to handles behind the seat to allow it to be pushed by another person.

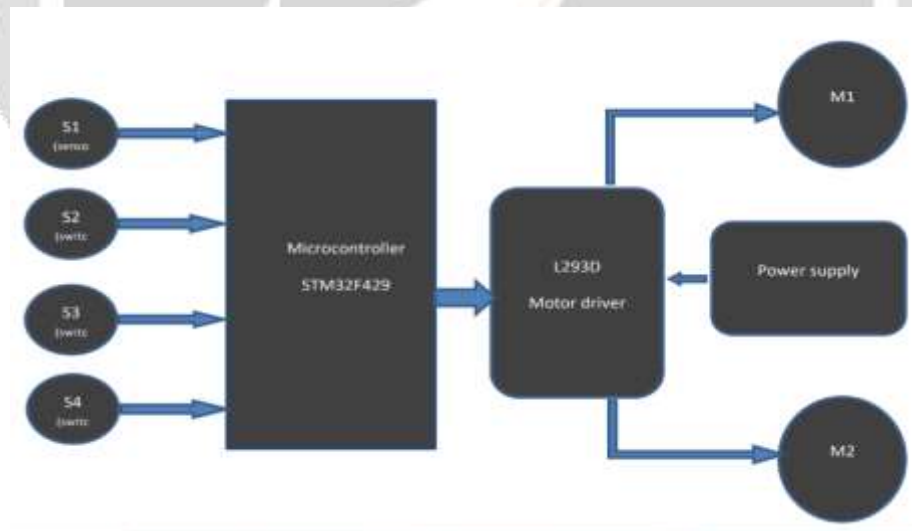
### 2.1 Solutions and objectives

In order to guide a wheelchair, various situations can be distinguished:

- If the user is capable of controlling his head or his hands, the ideal solution is the use of a joystick
- Where there is a high level of incapacity, solutions are basically centered on the use of other means, such as the voice or eye movements. In this case, the presence of safety sensors is justified with the object of assisting the user to guide the chair (detection of obstacles, nearness to certain places, and the existence of stairs.
- Only in extreme cases it is suggested that there may be a need for the chair to cover certain distances in an autonomous manner, without the need for any intervention on the part of the user.

## 3. BLOCK DIAGRAM OF AUTONOMOUS WHEELCHAIR

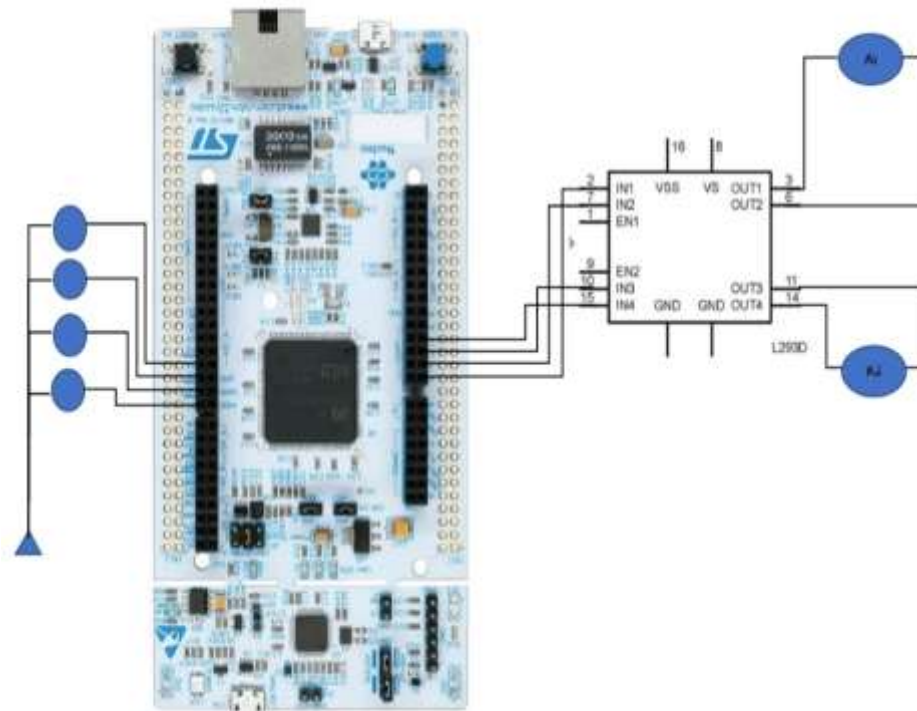
Figure 1 shows the system block diagram showing the interconnections between each block and module. All the modules are mounted onboard as to ease the wheelchair movement. We used switches to control the motor with desired operation, obstacle sensor used to achieve some independent mobility when any obstacle is there in front of wheelchair. The obstacle sensor will help the rider control the wheelchair by taking over some of the decision for steering and avoiding objects until user is able to handle the job.



**Fig- 1:** Block diagram of autonomous wheelchair

The movement of the powered wheelchair depends on the motor control and drive system which consists of microcontroller and motor driving. Once the switch is pressed system recognizes the path in comparison to the written in program, the respective coded digital signals would be sent to the microcontroller which then controls the wheelchair accordingly.

**3.1 Circuit diagram of autonomous wheelchair**

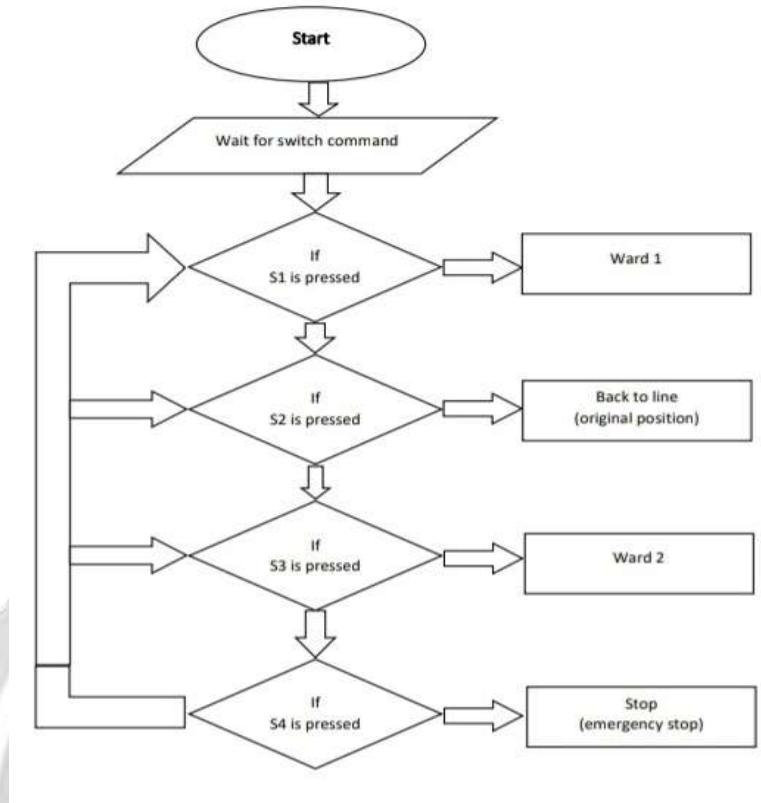


components	Pin connection	
Sensor(s1)	PF_13(D7)	
Switch(s2)	PE_9(D6)	} CN7
Switch(s3)	PF_14(D4)	
Switch(s4)	PE_13(D3)	
Motor (In1)	PG_1	
Motor (In2)	PF_9	} CN9
Motor (In3)	PF_7	
Motor (In4)	PF_8	

**Fig- 3:** Circuit diagram of autonomous wheel chair With their pin configuration

**3.2 Flow chart**

When the user press the **S2** button, the wheelchair moves in predefined direction to a desired location. Then Again **S2** is pressed the wheelchair back to original position in a predefined direction. Like this switch3(**S3**) is drives wheelchair to a ward2 or platform2 in a predefined path. Then Again **S3** is pressed the wheelchair back to original position in a predefined direction. The switch4 is provided for emergency stop. When sensor is detected the motors stop immediately by using the electrical braking method.



**Fig- 4:** Flow chart

#### 4. DISCUSSION

After the design and development of the wheel chair with respective interfacing circuits, the technology will be tested for the motion of the wheel chair using switches in a predefined path. The proposed design was implemented using modern concept. This would be implemented for disabled people after having the smoothly furnished design of the wheel chair.

**Results:** The important aspect of the wheelchair system is to find its velocity. While the autonomous wheelchair moving in a straight line, the distance and time is noted for velocity. and also time is noted for to take turns left and right with required angle. the autonomous wheelchair is allowed to move in a predefined path.

#### 4. CONCLUSION AND FUTURE ADVANCEMENTS

The social need is the independence of the physically challenged people. The mobility of the physically impaired people is made possible by the use of wheelchairs. Initially manual driven wheelchairs were used by physically handicapped people. However, the electrically driven wheelchairs are gaining popularity in the society.

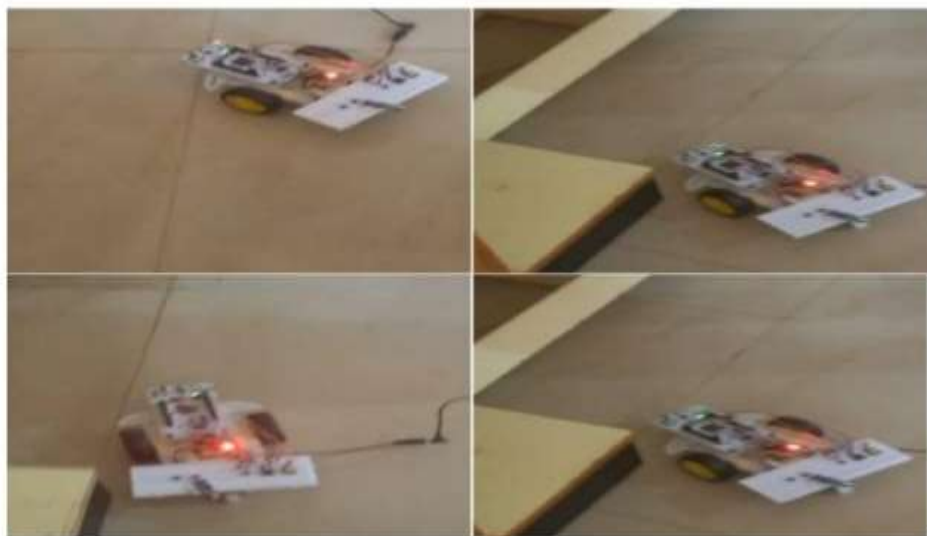
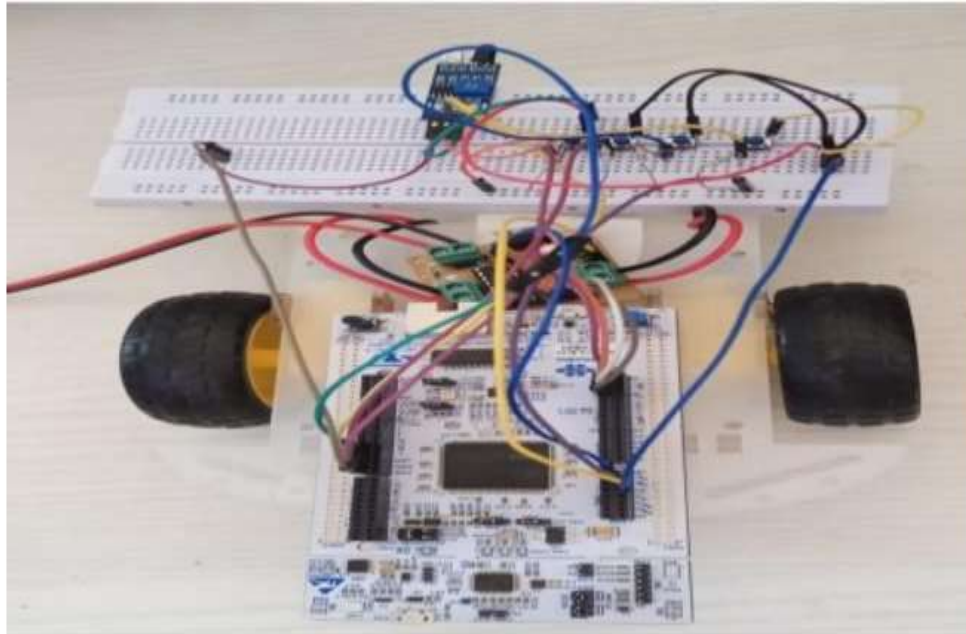
The aim of the project was to design a Autonomous wheelchair under a predefined path for disabled people usually depend on others in their daily life especially in getting from one place to another. From the above results and discussions following conclusion can be drawn. The Autonomous wheel chair runs successfully.

The proposed Embedded based switch operated autonomous intelligent wheelchair would bring more convenience for the disabled people. The technology can also enhance safety for users who use ordinary joystick-controlled powered wheelchairs, by preventing collisions with walls, fixed objects, furniture and other people.

A map and GPS system can be added to Arduino and by naming the places, wheelchair can go automatically to required place without commands of directions.

Ultrasonic and infrared sensors can be added to avoid obstacles in the way of the chair, and also voice recognition module can be added to control the wheelchair by voice. A camera can be added to back of the wheelchair and a small LCD screen to let the user see without moving.

### 5. RESULTS



**Fig-5:** Hardware interfacing of the model

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