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# Self-Propeller Kit for Wheelchair

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**ABSTRACT**:In overall India, significant population of people use wheelchair for more mobility. According to the 2011 census in India, almost 2.63 crores people were having disabilities, out of that only 20.3% require mobility aids such as wheelchairs. Although to access a wheelchair and other mobility aids still remains challenge for india. First Manual wheelchair was implemented, which required physical strength to propel the wheelchair to move to any direction. So to overcome these problem here we implement a self propel kit. This Self propel kit can be attached to the wheelchair, by using line following technique, it can be moved easily without the physical force from the user. This type of kit can be used by paralysed people, without depending upon others. These kits have the greater potential to enhance the independence and give them good quality of life especially for the paralysed people.

**KEYWORDS:**wheelchair, disabilities, Mobility aids, Self propel, independence, physical force.

## I.INTRODUCTION

As you know over all these years there are many wheelchairs implemented which can provide mobility for the users. So over these years this technology has been improved and refined, and in between 1980s to 1990s, line following robot came into common sights in manufacturing and warehousing, while materials can be moved around the factories and warehouse. During this period several improvements were made in their design and functionality of the wheelchair, and integrated new technique on them.At that time mainly researcher concentrated on developing lightweight wheelchair, by using steel instead of aluminum and titanium. This made wheelchair more portable and easier of user. By keeping these things in mind first powered wheelchair was designed at 1980s.After that these wheelchair improved by adding joysticks or switches on the handle of the wheelchair which was operated by the user. It was designed at 1980s after the powered wheelchair. So these devices where quiet expensive and bulky also. But these were very helpful for the people who wants to move around and indulge themselves in social work and etc., without relying any person to assit them.But there was a disadvantage as you know cost was more, because of that poor people cannot afford these wheelchair. Due to this they lost their independence and when they want go to washroom or anywhere else everytime they need assistance to carry them. So during 1990s researchers began to focus on making wheelchair more comfortable for the user.This was mainly depends on the user comfortable who can sit extended period of time on the wheelchairs. And another significant development was made in this period i.e lightweight and foldable wheelchair which can be easily transported and stored and making user to travel frequently. But in early 2000s, researchers started exploring the line-following technique in the design of wheelchair, so main aim is providing an indiviual with greater independence and mobility. Firstly black and white line following wheelchair was implemented, after that in 2007 one of first colour sensored line following wheelchair was developed by the group researcher in japan. So this wheelchair will navigate to predetermined route which was controlled by the user.

From 2000s to present there was rapid development in innovation and also there was greatest improvement in the wheelchair industry. One of the major development was usage of advanced materials in wheelchair construction. Another significant development has been the integration of electronics and digital technology into wheelchairs. This leads to the development of smart wheelchair which can be controlled by such as smartphones, tablets, or voice commands. So this wheelchair can also be fitted with sensor which can detect obstacle and help to move wheelchair for line following technique. So during 2007 colour sensor based line following wheelchair was introduced and also it was intregrated with other technologies such as GPS and artifical intelligence into the wheelchair. So these technologies where introduced with wheelchair, without it won't get operated. And its cost will more which couldn't afford normal people. This will be loss for the people who have normal wheelchair because integrated features cannot be fitted to the normal wheelchair. So here is our aim to design a kit which is a self propled kit for wheelchair which includes multicolour line following technologies by using that patient will go to respective rooms. And it can be fitted to any wheelchair where user need not need to buy advanced wheelchair for his mobility. This kit will be fitted to the wheelchair with electromagnetic lock which will be inserted on the handle. The cost of self propled kit for wheelchair will be less any people can afford.Today, there are many companies and organizations around the world that specialize in the development and manufacturing of color sensor-based multiple line follower wheelchairs, with the aim of

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providing individuals with mobility impairments with a more accessible and customizable means of navigating through different environments.Overall, the history of color sensor-based multiple line follower wheelchairs highlights the potential for robotics and artificial intelligence to improve the quality of life and independence of individuals with mobility impairments, and to provide them with greater access to the world around them.

## II. LITERATURE REVIEW

[1]. Celia Shahnaz, Ahmed Maksur, Shaikh Anowarul Fattah,
And Shafayet Chowdhary (2018) "Low cost smart electric wheelchir with destination mapping and intelligent control features."
**Description:**In this paper , wheelchair is designed in a such a way that it provide greater indepenence, safety and convenience to user to move.It provides greater benefits for the individuals with mobility impairments. Here main feature of wheelchair is destination mapping. This feature allows the user to provide input as desired destination, and w.r.t desired input wheelchair will navigate to that destinstion. By using these features in this project paralysed person can go anywhere without depending upon others.
[2]. Amit Sutradhar, Md. Smaiul Haque Sunny, Manash Mandal, Rubel Ahmed (2017) "Design and construction of an automatic wheelchair: an economic approach for Bangladesh."
**Description:**As everyone know designing an automatic wheelchair may increase in cost due to that people cannot afford. By keeping these things in mind, this wheelchair was designed and constructed in such a way that it can make afforable and accessible over a wider range. This design of wheelchair involves uasage of low cost and locally available materials those are steel, plastic and aluminium. And also this may be designed with simplicity and ease for maintenance, to reduce the repairing cost and maintenance costs.
[3]. Maryam Amur Khalfan, Al shabibi, Suresh Manic Kesavan (2021) "Iot based smart wheelchair for disabled people."
**Description:** So in this design of wheelchair contains one main benefit i.e, it can enable paralysed or disabled people to move more independently and also have greater control over environment. For example, sensors and cameras will equppied to wheelchair to stop when it captures and senses obstacle. This feature is mainly used to paralysed user though he cannot move his hand due to his disabilities. By keeping this in mind we can implement in this project.
[4]. R.Josephine leela, A.Joshi, B.Agasthiya, U.K Aarthiee, E.Jameela, S.Varshithata (2017) "Android based automated wheelchair control."
**Description:** In this wheelchair is automated by Android based so that user can move easily anywhere and also others can move user to the desired destination. Some of the features that can controlled by the user those are voice control,Obstacle detection and avoidance, it can also customise the settings according to the user needs.

## III. PROBLEM DEFINITION

Traditionally wheelchair user were required to use their upper body strength to move wheelchair which can be very difficult for the user.By this there was lack of independence and mobility impairments. So here we are implementing self propel kit for wheelchair which can be easily fixed to normal wheelchair rather than buying upgraded wheelchair which will high in cost.Therefore, this kit for wheelchair could be improving the mobility and independence of user with mobility impairments by providing a more accessible and reliable means of navigating through different environments and obstacles, while also addressing challenges such as accuracy, reliability, and cost.

## IV. OBJECTIVES

The main aim of this kit is used to assistive devices to promote mobility for an individual and enhance the good quality of life for people who have difficulties in walking.The patients wil be able to do all their works including studies, engaging in social activities and get access to healthcare services due to the mobility provided by the self propeller wheelchair. So in addition to providing mobility, as you know an advanced wheelchair benefits the physical health and also provide good quality of life. So by keeping these things in mind here our main aim is to design a self propel kit for wheelchair which can be fixed to wheelchair and also it provides mobility for an wheelchair user.This will help patients who are paralysed to move to their respective rooms or operation theatre without any physical force to the wheelchair.

## V. METHODOLOGY

Initially the wheelchair is present on top of a colored line. When a button is pressed refering to a color code of a line, the aurdino will detect the colour through the colour sensor. If the color selected is present or detected, the wheelchair

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will start moving following the respected coloured line. The program stored in aurdino is read when the button is pressed.

When an obstacle is present infront of the moving wheelchair, the sensor will sense the obstacle and stop moving. At the end of the line I.e., infront of the room or destination door, the wheelchair will detect door as an obstacle. The patient has to unlock the door using the remote to the electronic lock attached to the door. Once the door is open, the wheelchair will move inside the room.

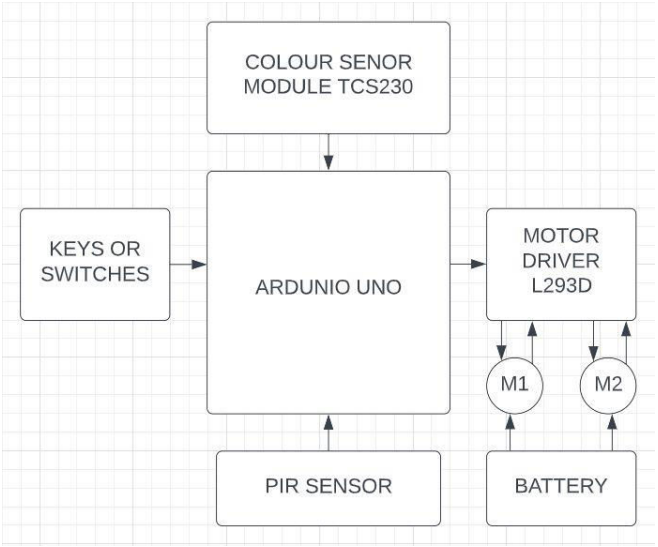


Fig.5.1 Block Diagram of self propeller wheelchair kit

## VI. FUNCTIONAL PARTITIONING

**1. Control Unit**

The whole circuit is controlled by the aurdino uno board which stores the program for working of the circuit. It gives the signal to various components and helps for communication of other components. It acts as the heart of the system or circuit.

It obtains signals from other components and sends signals in response to the received signals so that proper output is for the motor to operate.

**1. Sensing Unit**

In this circuit there are two different sensory components.

Colour sensor TCS230:

It is a type of photoelectric sensor. In this, the sensor will transmit a light from the transmitter and the transmitted light is reflected from the ground. This reflected light is detected by the sensor. It uses RBG to sense thee colour gradients. The emitted light is white light and reflected light consist of colour gradient whicvh hellps the sensor to sense the colour present.

PIR sensor:

It is a sensor used to detect movements infront of the moving wheelchair. Once an obstacle is detected, the signal is sent to the aurdino which sends a signal to motor driver to stop the movement.

## VII. MOVEMENT OF WHEELCHAIR

**1. Forward motion**

When the aurdino gets a signal for movement, the colour sensor will detect the line and send the signal for forward movement of the wheelchair. When this signal is received by the motor driver, the motor driver will turn the motor on and both the motors will start moving forward until diversion or obstacle is detected.

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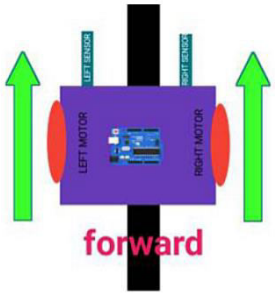


Fig 7.1: Forward movement

**2. Left Motor Motion**

When the aurdino gets a signal for movement, the colour sensor will detect the line to move towards left and send the signal for left motor movement of the wheelchair. When this signal is received by the motor driver, the motor driver will turn the left motor on and the right motor is halted.

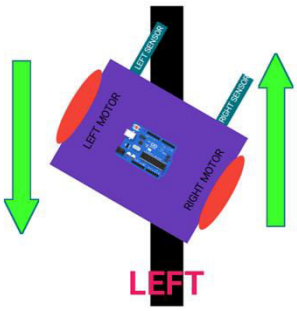


Fig 7.2: Left motor movement

**3. Right Motor Motion**

When the aurdino gets a signal for movement, the colour sensor will detect the line to move towards right and send the signal for right motor movement of the wheelchair. When this signal is received by the motor driver, the motor driver will turn the right motor on and the left motor is halted.

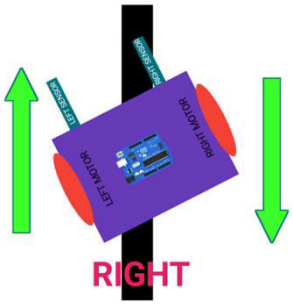


Fig.7.2: Left motor movement

**4. Halt**

During the movement of the wheelchair, if the coloured line is interfered, damaged or if any obstacle is detected infront of the wheelchair, the sensor will send signal to the aurdino and the aurdino will send the signal to the motor driver and both the motors stop moving.

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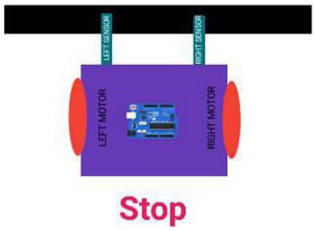


Fig.7.4: Halt

## VIII. ADVANTAGES

- Increased Independence: So this kits provides mobility impairments for the wheelchair user to move around independently and it follow pre-defined paths without assistance from others.
- Improved accuracy: This kit uses colour sensor module which will appropriately detect different colored line and distinguish between multiple lines w.r.t to pre-defined routes.
- Cost-effective: So this self propeled kit for wheelchair are generally less expensive when compared with other advanced wheelchair.
- Greater flexibility: So this kit is programmed in such way that it senses the line and follow different paths and navigate through different direction providing more flexibilty.
- Improved safety: By using pre-defined paths which was programmed, the wheelchair will reduces the risk accidents and detects the obstacle before collision occur.
- Simple operation: This kit will be easy to user and does not require complex instructions or any of the training is not required to operate wheelchair.

## IX. APPLICATIONS

- Hospitals and rehabilition centre
- Public transportation,
- Education institutionals
- Theme park and entertainment venues.
- Home use.
- Shopping center
- Workplaces.

## X. CONCLUSION

This self propelled kit makes the use of instructions from color sensors and on board logic circuits to perform physical movements.Overall, this self-propelling kit provides an accessible and affordable way to explore the possibilities of autonomous motionby utilising colour sensors to detect and follow coloured lines. The wheelchair can navigate through pre-defined paths in an easy way, which can allow the user to move independently. Further improvement in this field can improve the performance and accessibility of wheelchair which will provide individual with mobility impairments.

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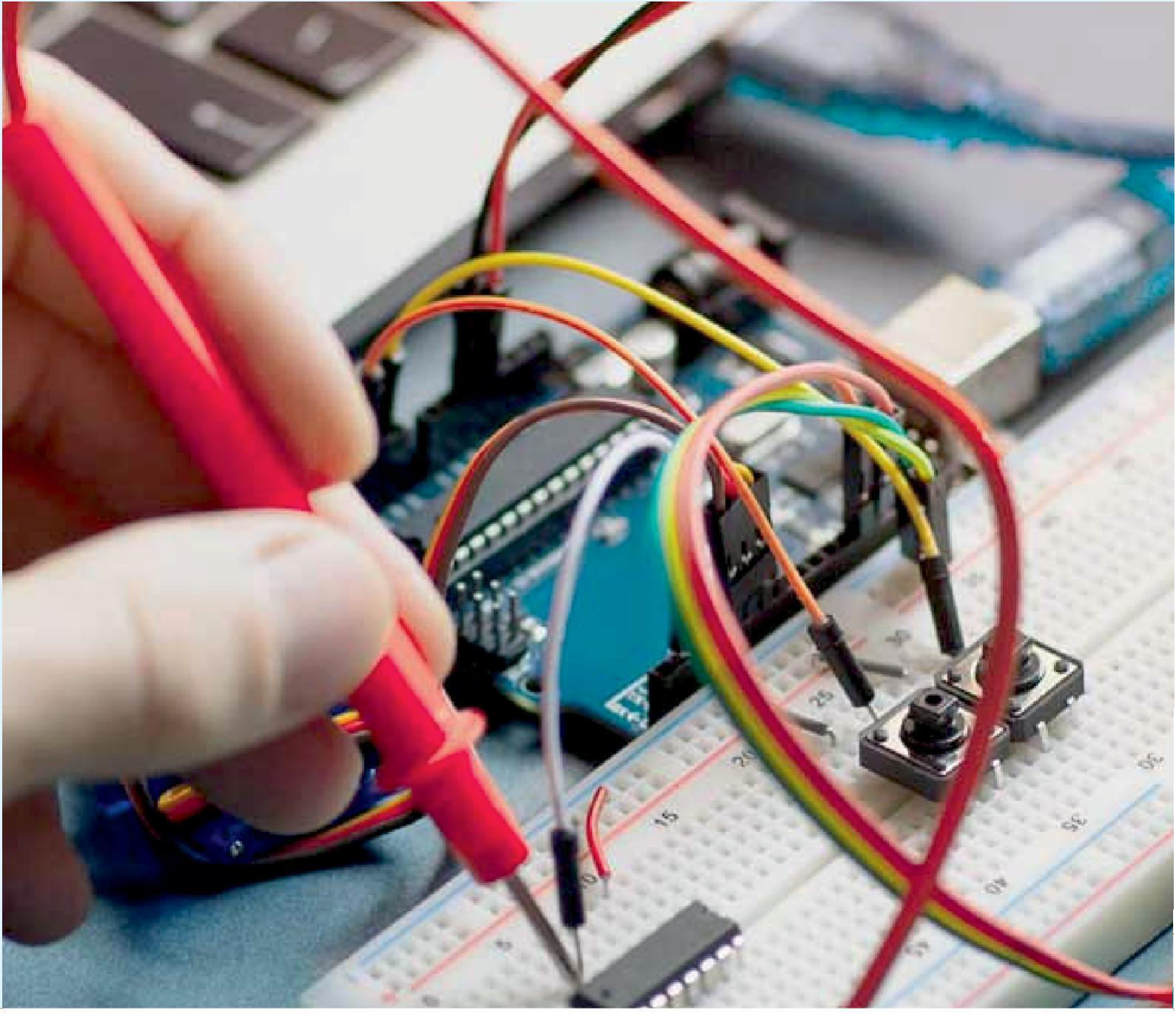

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