Sensor Based E-Bike for College Campus

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Abstract- Present day skateboards and bikes are truly engineering marvels; nevertheless they have already been so refined that they are quite simplistic by today's high technology standards. Rapidly advancing technologies in many sectors including potential E-bikes are classed according to the power that their electric motor can deliver and the control system, i.e, when and how the power from the motor is applied. As such, the classification of these e-bikes varies greatly across countries. The classification of e-bikes is mainly decided by whether the e-bike's motor assists the rider using a pedal –assist system or by a power-on-demand one. The existing systems are the electric powered manually balanced wheeled vehicles via the means of the electric motors. But for most of the users balancing the vehicle at lower speed is a difficult task and with limited technology mounted on the vehicle. To overcome this drawback we are introducing the self balanced smart E-bike with a smart phone or a tablet integrated on its dashboard for monitoring college campus or hospitals etc. We have proposed a concept called sensor based E-bike for college campus for monitoring which consist of two wheels connected two dc motors arranged side-by-side, with a small platform between the wheels, on which the rider stands. The directions of E-bike are controlled by the rider's hand positions which are detected by IR sensors connected to the arduino controller which gives commands to the E-bike to move accordingly as well as there is an integrated manual operation .The main intention of this project is to build a smart E-bike for higher authorities to move freely around the campus and monitor the classrooms through the smartphone or the tablet integrated on the dashboard of the E-bike. This E-bike can be operated using hand movements or with manual joystick operations and also come with an dashboard on which control switches for bike movements, horn, light, smartphone/tablet can be mounted.

Index Terms- IR sensors, E-bike, Smartphone/tablet, Arduino controller, Dc motors.

I. INTRODUCTION

Sensor based E-bike for college campus for monitoring which consists of two wheels connected two dc motors arranged side-by-side, with a small platform between the wheels, on the which the rider stands .The direction of e-bike are controlled by the rider's hands movements which are detected by is sensor connected to the arduino controller which gives command to the e-bike to move accordingly as well as there is an integrated manual operation. The main intention of this project is to build a smart e-bike for higher authorities to move freely around the campus and monitor the classroom through the smartphone or the tablet integrated on the dash board of the e-bike .This e-bike can be operated using hand movements or with manual joystick operations and alsocome with an dashboard on which control switches for bike movements, horn, light, smartphone /tablet can be mounted.

II. PROPOSED SYSTEM

A. *Block Diagram*–

We have proposed a concept called sensor based E-bike for college campus for monitoring which consist of two wheels connected two dc motors arranged side-by-side, with a small platform between the wheels, on which the rider stands. The directions of E-bike are controlled by the rider's foot positions which are detected by IR sensors connected to the arduino controller which gives commands to the E-bike to move accordingly as well as there is an integrated manual operation. The main intention of this project is to build a smart E-bike for higher authorities to move freely around the campus and monitor the classrooms through the smartphone or the tablet integrated on the dashboard of the E-bike. This E-bike can be operated using leg movements or with manual joystick operations and also come with an dashboard on which control switches for bike movements, horn, light, smartphone/tablet can be mounted.

B. Algorithm steps–

The working of the project can be explained in the following steps:

Step 1: Initially 5v power supply is given to the IR sensors, Arduino microcontroller and motor drivers.

Step 2: IR sensor is ready to receive the commands.

Step 3: If the IR sensor1 is off and IR sensor2 on then the E-bike moves left side.

Step 4: If the IR sensor1 is on and IR sensor2 off command is RIGHT the E-bike moves right side.

Step 5: If the IR sensor1 is on and IR sensor2 on command is FORWARD the E-bike moves forward.

Step 6: If the IR sensor1 is off and IR sensor2 off command is STOP the E-bike stops moving.

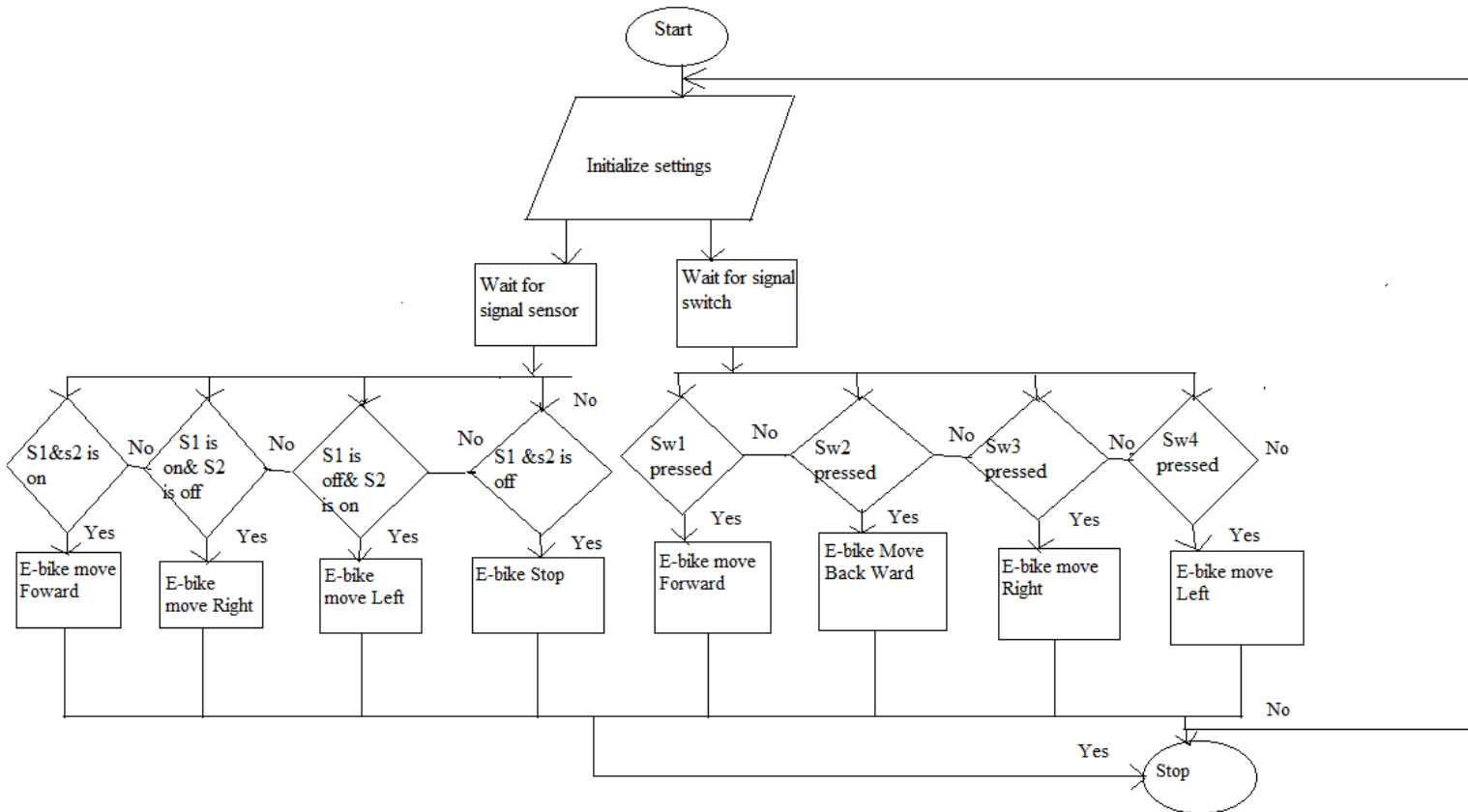Step7: If the switch1 is pressed the E-bike moves forward.

Step8: If the switch2 is pressed the E-bike moves backward.

Step9: If the switch3 is pressed the E-bike moves right.

Step10: If the switch4 is pressed the E-bike moves left.
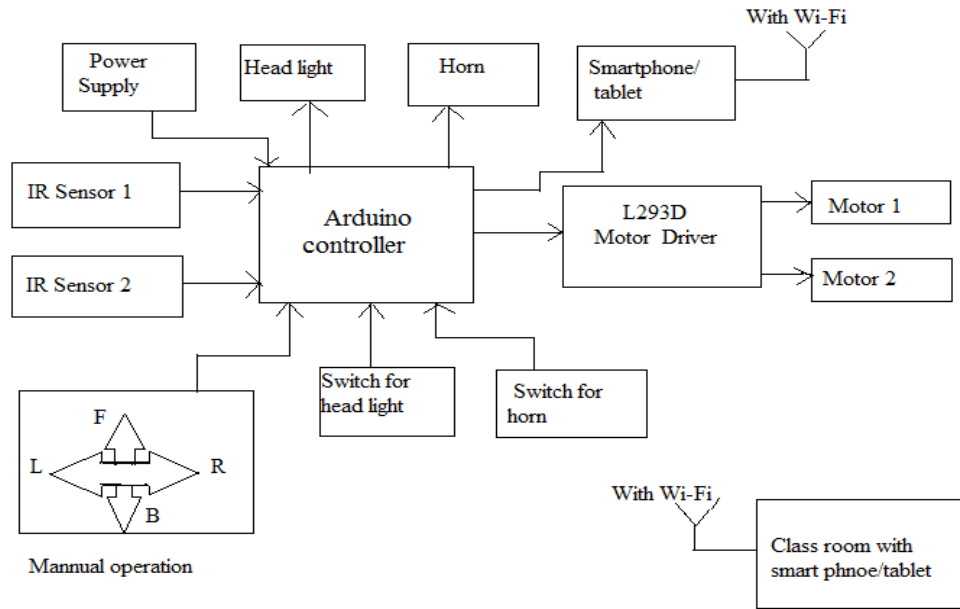
Figure1: Sensor based e-bike block diagram
C. Flow chart:

Figure:2 Flow chart

D. Hardware Implementation –
Power supply:

9v or 12v battery is used for giving power supply for ir sensor, arduino microcontroller and motor driver. 7805 regulator IC is used to give constant dc 5v output which is given as operating voltage for the ir sensor, Arduino micro controller as well as motor driver.

IR sensor:

We are using two ir sensors and these have three pins, output pin is connected to the arduino micro controller and input pin is connected to the power supply board and ground pin is connected to the ground in power supply. These sensors are used to detect the hand movements of the person who is standing on it. These commands are trained.

Command	IR Sensor Module Output
Forward	sen1=1, sen2=1
Left	sen1=0, sen2=1
Right	sen1=1, sen2=0
Stop	sen1=0, sen2=0

Micro controller:

12v rechargeable battery is connected to the microcontroller so that microcontroller get 5v constant dc output supply to the arduino board. The two IR sensors are connected to the pin 12 and13 pin of microcontroller where it senses the hand movements. Pins (4-7) of micro controller are given to the motor driver as an inputs. Push buttons are connected to the pins (8, 9, 10, 11) of arduino microcontroller.

Motor Driver and Motor:

Pins (4, 5, 6, 7) of arduino micro controller is given to the motor driver input pins(2,7,15,10).The motor pins is given to the motor driver as an output .5v battery is given to the vcc pins of motor driver. From the vcc it is connected to the 8 pin of motor driver.

Switch operations:

In addition to the ir sensor we also have manual operation that is switch operation. In switch we have two pins one pin is connected to the 5v pin of arduino controller and another pin is connected ground pin of arduino controller. These operations are done according to the given commands below.

Command	Switch module outputs
Forward	s1=0, s2=1, s3=1, s4=1
Backward	s1=1, s2=0, s3=1, s4=1
Left	s1=1, s2=1, s3=0, s4=1
Right	s1=1, s2=1, s3=1, s4=0
Stop	s1=0, s2=0, s3=0, s4=0

Web of cam

This application is used for monitoring the classes while moving in corridor. By placing the mobile in the class room and also on the e-bike with web of cam app along with Wi-Fi. So that they can watch the classes while moving on e-bike.
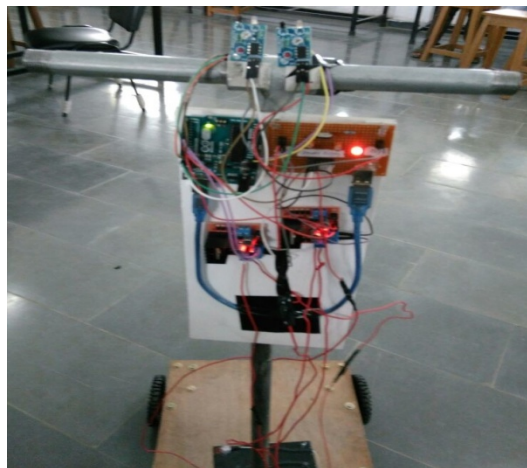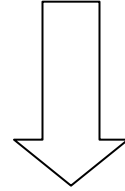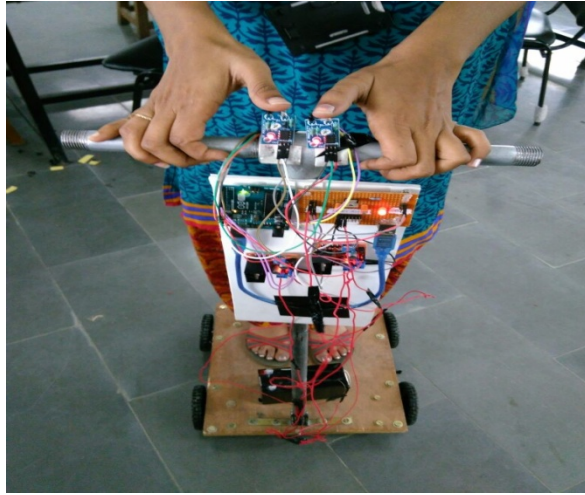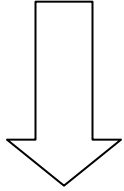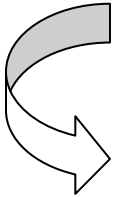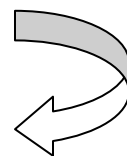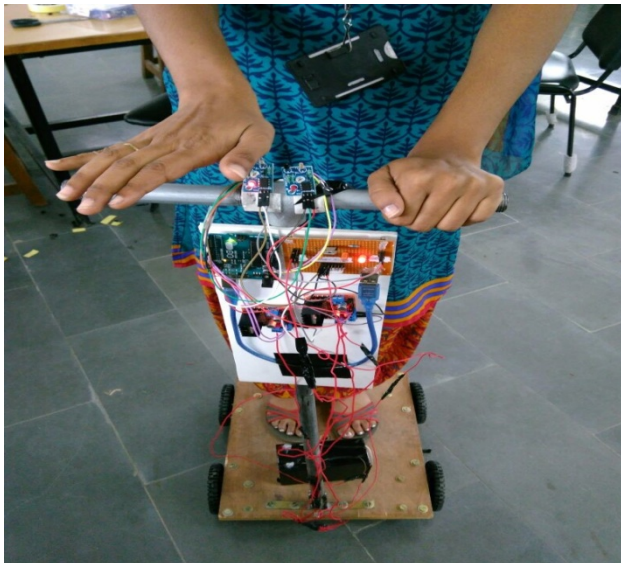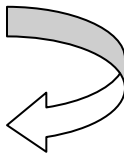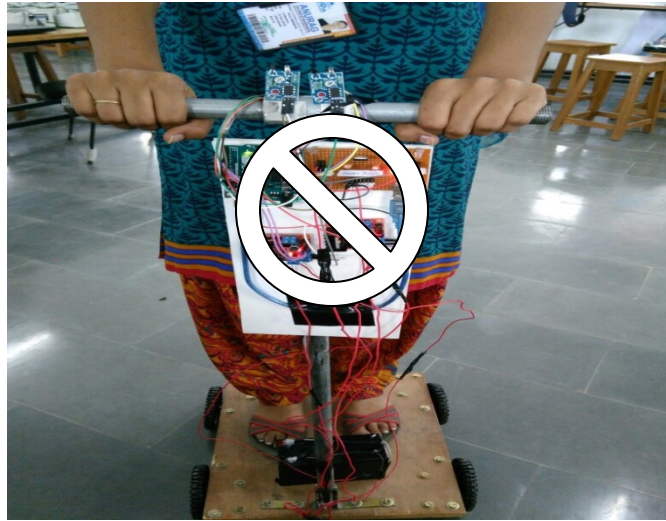
III. EXPERIMENT AND RESULT

Fig: 3 sensor based e-bike for college campus

(a)
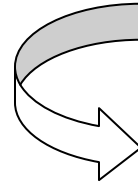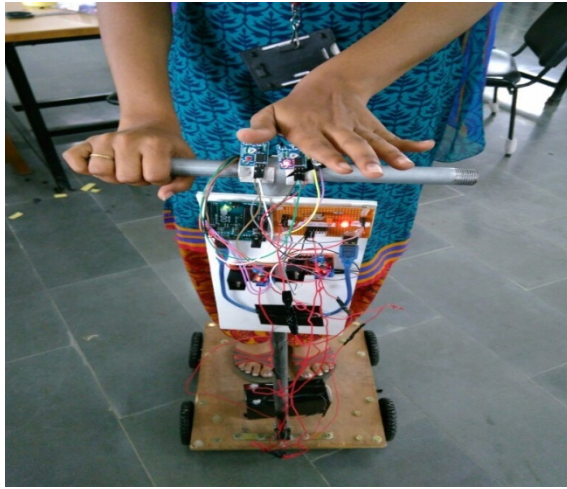
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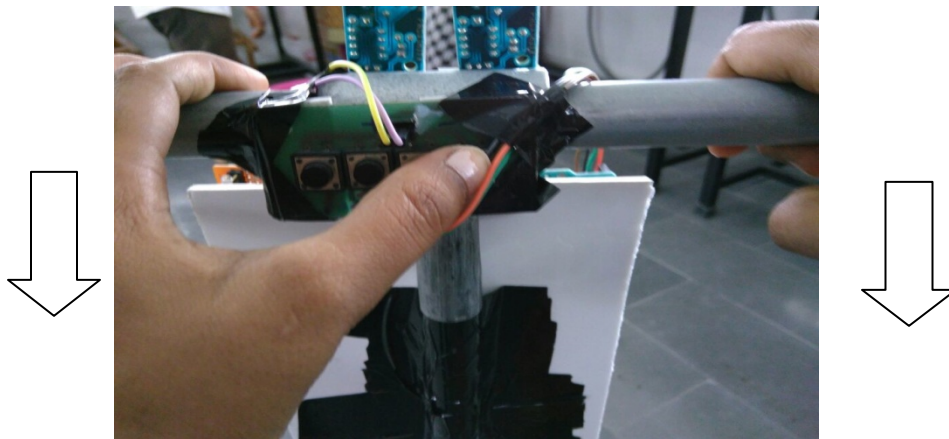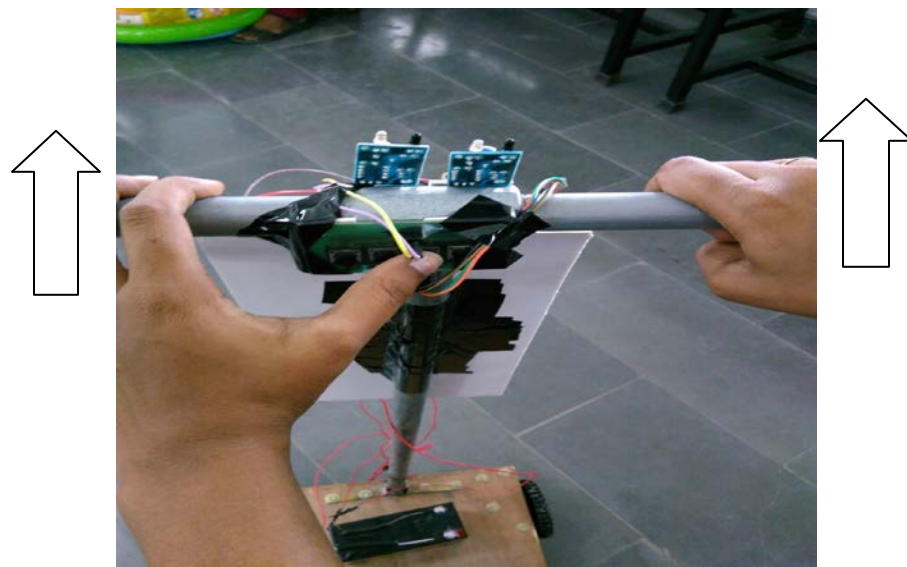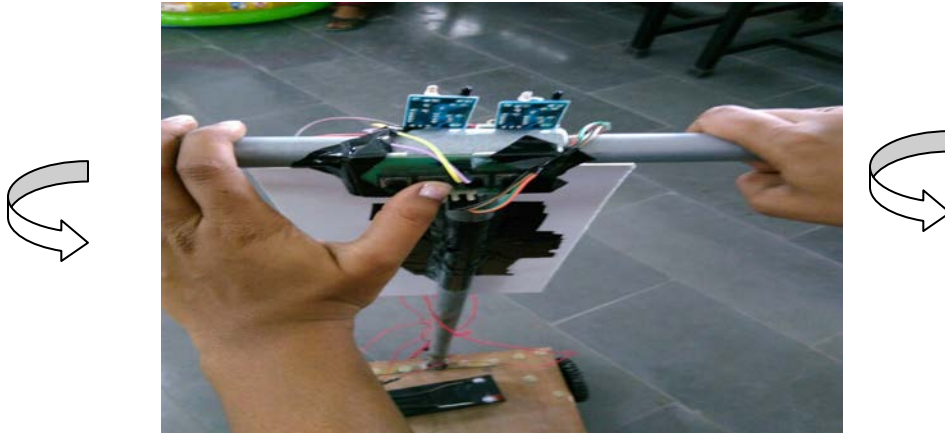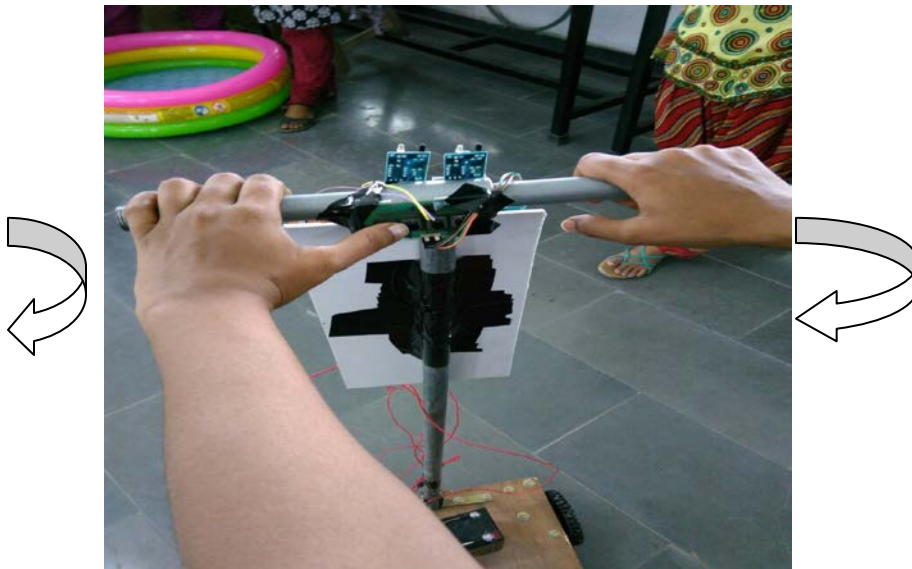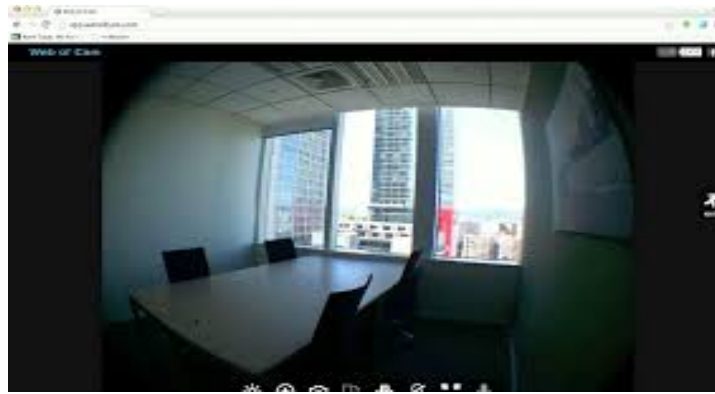
(c)

(d)

(e)

(f)

(g)

(h)

(i) Web of cam

Sensor operations

(a) When the sensor1 and sensor 2 is on then the E-bike moves forward.

(b) When the sensor1 and sensor 2 is off then the E-bike get stops.

(c) When the sensor1 is off and sensor 2 is on then the E-bike moves left side.

(d) When the sensor1 is on and sensor 2 is off then the E-bike moves right side.

Switch operations

(e) When switch 1 is pressed the e-bike moves forward.

(f) When switch 2 is pressed the e-bike moves backward.

(g) When switch 3 is pressed the e-bike moves righ.

(h) When switch 4 is pressed the e-bike moves left.

IV. CONCLUSION

The paper has been successfully designed and tested. It has been mainly designed in order to reduce human effort. Many existing systems have discussed about the E-bikes and have proposed many methods for reducing their efforts. But still there is a difficulty in moving manually. So, in order to avoid that difficulty, instead of walking in campus electrically or by gestures, our project succeeded in moving the wheel chair using hand movements. When the hand movements are given by the person standing on the e-bike, using IR sensors or manual switch operations the commands are received, and according to those movements the motors will move which in turn moves the E-bike.

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