SEGUE

A PROJECT REPORT

Submitted by

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In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

in

INSTRUMENTATION & CONTROL

ATMIYA INSTITUTE OF TECHNOLOGY AND SCIENCE

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GUJARAT TECHNOLOGICAL UNIVERSITY

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I would like to put on record, my appreciation and gratitude to all who have rendered their support and input. Without them, it would not have been possible for me to shape this study.

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http://www.google.com/patents/US20080147281	Patent US20080147281 - Travel device - Google Patents	46	1	46	1
http://electronics.stackexchange.com/questions/122128/understanding-this-statement-in-atmega328ps-datasheet	atmega - Understanding this statement in ATmega328P's ...	39	1	39	1
http://html.alldatasheet.com/html-pdf/313653/ATMEL/ATmega48PA/471/3/ATmega48PA.html	ATmega48PA datasheet(3/448 Pages) ATMEL | 8-bit ...	385	7	346	7
http://microcontrollershop.com/product_info.php?products_id=3500	Atmel ATmega328P-PU AVR Microcontroller, 28 DIP, 2	81	2	81	2
http://science.howstuffworks.com/transport/engines-equipment/ginger1.htm	Self-Balancing Human Transporter - HowStuffWorks	29	1	29	1
http://triton.towson.edu/~swartout/cosc311/segway.html	Howstuffworks "How Segways Work" - Towson University	134	3	27	1
http://www.google.com/patents/US20130238231	Patent US20130238231 - Two-Wheel, Self-Balancing Vehicle With ...	82	2	37	1
https://www.arduino.cc/en/Main/ArduinoBoardNano/&q=nano&sa=X&ei=3_n_T4eGCqGb0QXe1M27Bw&ved=0CDcQFjAI	Arduino - ArduinoBoardNano	71	1	71	1
https://www.arduino.cc/en/pmwiki.php?n=Main/ArduinoBoardDuemilanove	Arduino - ArduinoBoardDuemilanove	56	1	0	<1
http://chips.com.pk/arduino-nano/	Arduino NANO - ChipsTech	71	1	0	<1
http://playground.arduino.cc/Main/MPU-6050	Arduino Playground - MPU-6050	73	1	73	1

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SEGUE (UDP)

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Arduino..... 22 Technological University for the partial completion of project at the end of the 8th semester. I would like to put on record, my appreciation and gratitude to all who have rendered their support and input. Without them, it would not have been possible for me to shape this study. We would

to express our special thanks of gratitude to the Atmiya Institute of Technology & Science for facilitating all the requirements, our principal Mr. D.Acharya, our project guide Mr. Jimit A.Talati and the HOD Mr. Kuldeep Tarpar.
OF INSTRUMENATION & CONTROL ENGINEERING 2015-16 CERTIFICATE Date: This is to certify
out by NAME OF THE STUDENTS under my guidance in fulfillment of the degree of Bachelor of Engineering in Instrumentation & Control Engineering semester) during the academic year 2015-16. Guide: Mr. Jimit A.Talati Assistant Professor Instrumentation and control Dept. A.I.T.S-Rajkot Head of the Department Chapter 1: Introduction Segway is the Hi-Tech scooter which is used to move from one place to another place. It scooter so it consisting of two wheel but both the wheels are parallel to each other that are placed side by side. To move forward or backward on the Segway, the rider used to lean slightly forward or backward using handlebar and to turn left or right the rider turns the handlebar in right or left side. The balancing act is most amazing and interesting thing about the Segway, and it is the key operation to ride it. Basic Principle principle behind the working operation is comes from in our body operation. If we stand up and lean forward, we will out of balance, and we probably will fall on upon ours face. But our brain knows that we are out of balance, because of fluid in your inner ear shifts, so it triggers us to put ours leg forward and stop the fall. If we keep leaning forward, our brain will keep putting our legs forward to keep us upright. Instead of falling, we will walk forward, one step at a time. The Segway also does same things. Instead of legs it has wheels, a motor instead of muscles, a collection microprocessors and microcontrollers instead of a brain and a set of sophisticated tilt sensors instead of an inner-ear for balancing system. Like our brain, the Segway knows when we are leaning forward. To maintain balance, it turns the wheels at just the right speed, so we move forward Problem Summary The first problem with the Segue is the price. This technology is not reasonable to low-income individuals. The vast market for the Segue would be college students, however, this market has not been tapped into. University campuses are usually huge and getting from one class to the next and aft to dormitories can be a long distance when one has to walk, but college students cannot afford to buy the Segue for their use. The solution to this problem is for manufacturers to use nominal but safe technology in order to decrease the price. A second issue is lack of advertising; few people know about Segway dealerships, the cost and the great invention that it is, the solution would be to advertise more. The Segue is not only a great latest thing , but it is also environmental friendly since it is fully electrical and does not release any emissions this would appeal to a lot of people if they knew it existed. The final problem with the Segue is that the technology is so new and when it breaks down the manufacturers are forced to recall all Segues and this can be valuable. Unlike cars where there is an abundant of mechanics to fix them when they break down, the Segue does not enjoy the same benefit, the solution to this problem would be to provide users with very simplified manuals and an excellent technical support team that can be easily reached by dialing a toll free number. The Segue has probably bright future, because after most of the problems are taken care of, it will eventually be widely used and accepted as a form of transportation that is better than the bicycle Some of the progress in the future would be the addition of an umbrella that is attached to the handlebars and can be opened at a touch of a button Segues will be converted to transport more than one person, there will be room for a passenger. Also, the manufacturers will make smaller Segues for young kids, Segues with more tractable covers to shield the user from bad weather and proper nightlights so it can be safely used twenty four hours a day. Lastly, when the Segway is widely used there will have to be Segue lanes for the riders. 1.2 Aim and Objectives of the project Segue is expensive now a days. That's why common people can't use it. In a country like India where rich people are less in number compared to middle class and low class people, it is not preferable. If it available for low cost it will be preferred by all. That is the ultimate aim of our project.
makes Segue with a cost around of Rs 30,000/-. We named it as segue or human transporter or homemade segue. Our country people phase the problem". In addition, they also appeared set on solving the "bicycling problem." The Segue can best be compared to the unicycle. It even looks bit like one. In Segue used the gyroscope and accelerometer for the solved many problem of self-balancing. Segue is easily handle and low parking space is required. Its product in the less pollution. Our design work in the solar energy. Solar energy is renewable and easily getting in the morning. This energy is free of cost is used and this benefit is plus point of segue cost. Segue in less pollution because this design in not used any fuel. Our project is eco-friendly and all people is easily used. 1.3 Problem Specification The numbers of persons who are golf player on others servant or a big car that's way only used a new technology and easily go with any place of garden and paly game. Rich people doesn't like to walking long distance so the used segue for our walking. Parking space is no more so the people phase problem of parking that time segue is used The current mechanism includes many new changes as compare to classical approach. In classical approach person need to give more efforts for having mobility and which is much tiresome and sometimes need person for their help. But now a days this things are replaced by new techniques. With help of hardware and software those efforts were diminished by providing different inputs or command which can easily move segue. Those different inputs are joy stick, touchpad, accelerometer etc. 1.4Prior Art Search (PAS) Now a days we can see rich people have main problem of mobility. So came with an idea of Smart segue which can help them to remove this deficiency. We have visited Mall, Garden, Playground and talk with people and took different suggestion. Also we talk with people who are facing disability. And then we have started to search the solution of this actual problem For this we have taken help from college and project guide. Then we have started to find the patents related to this innovation. 1.5 Plan
Fig. 1.5: Plan of the work 1.6 Materials and Tools Requirement Chassis Motor Battery Relay Accelerometer
Analysis, Design Methodology and Implementation Strategy 2.1 AEIOU Summary Activities: Visit, Meeting, Discuss Idea, Research Idea, Environment: Resource Use, Air Pollution, Waste, Noise Pollution, Land Take, Climate Change. Interactions: Professor to Student, Student to Student Manager to Employer, Event coordinator to Student. Objects: Motor Assembly, Chassis, Battery, Joystick, AR-Tactile, Sensor Gyroscope. Users: Manager Engineer, Rich People, Sport Person, Corporative member, Student, Tourist Guide. Fig. 2.1: AEIOU Canvas 2.2Ideation canvas:
covered in this canvas it focused on the people being influenced by the project, Activities to be done to achieve the milestones. "What is the best way to describe the necessary actions? Does each action have a direct link to one or more of the outcomes? Are the actions detailed enough to develop a project plan?" all these questions were answered by various teams in their ideation canvas in props/possible solutions. Schematic shows the typical ideation canvas sample. People: Manager, Engineer, Rich People, Sport Person, Corporative member, Student, Tourist Guide Activities: Low power consumption, Avoided Accident, Robust System, Fuel Saving, Quick Operation Situations/context/location: Controlling Speed, Save Life, Garden, in mall On the Road, Tourist place, Technical Event. Problems/ possible solution: Better speed motor, SPDT relay, Different Model, Multipoint Control, High Accurate Sensor, Compact size, Low cost. Fig. 2.2: Ideation canvas <2.3Empathy Mapping Canvas: User: Manager, Engineer, Rich Corporative member, Student, Tourist Guide Stakeholders: Manager, Engineer, Rich People, Student Activities: Self Balancing, Controlling speed Better grip over wheel, Fuel saving, less power consumption, easily controlling. Story Boarding: Related to project <
Canvas 2.4Product Development Canvas: Purpose: Over low speed, Technology used in day to day life. People: Manager, Engineer, Person, Corporative member, Student, Tourist Guide Product experience: In this we provide self-mobility by giving advanced facilities. Product functions: Self Balancing, Robust system, super compact body, Good performance, controlling speed. Product feature: Medium Weight, Compact size, Zero Turning Radius, Quick Operation, Eco-friendly. Components: Chasse, motor, Arduino Nano, Gyroscope, Wire, Relay, Wheel, and Battery. Customer revalidation: user friendly design, add any new navigator system, increase speed. Retain/ Redesign/ Reject: implement uln2003 for control rejected Bluetooth system, Expensive vehicle, Used in a specific area. Fig.2.4: Product development canvas Chapter
Diagram Fig.3.1: Block Diagram In any system input
working as a joystick. Accelerometer is fixed with the handlebar. Accelerometer is main part of the system and work as a sensor. Accelerometer will generate the signal and it will pass that signal to the controller. We have used Arduino as controller. As Arduino work only at 5V we have to use

voltage regulator power supply. We have use relay circuit to drive motor. Both the wheels are fixed with the motor. So when the controller gives the signal to the motor, motor will rotate according to it and connected wheels will rotate. So as the handlebar move according to that accelerometer generate the signal that will pass to the controller, controller takes any action and that signal given to the wheels through the motor Working of project We are making this project for commercial use. In this two wheeler vehicle there is much complexity. There is two wheel with two motor which are powered by 12V DC battery. We have placed tilt sensors for balancing purpose which will give its output signal to the and it will rotate following to that signal. We have used an accelerometer module to use handlebar as a joystick. We have placed it at the handlebar and as it moves forward the segue will move in forward direction. Similarly it will move in all four direction as handlebar will move. For purpose we are going to use gyroscope as a tilt sensor which will generate output signal when it will goes unbalance. That signal is applied to the motor and it will rotate following to the signal. 3.3 Circuit Diagrams and Explanation Fig. 3.2: DC motor control using SPDT relay The Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit "receives" current, other one doesn't and when the coil gets energized the opposite is happening. 3.4 Hardware Description Chassis wooden plate which is supported by iron plate. We had made iron plate by keeping place to adjust wooden plate which is used in to stand upon it. By screw and nut system the wooden plate is supported on iron plate. Wheels are attached with the motor and is placed in middle part of the chassis. The handlebar is made of steel rod and is fixed using clamp. Motor We have used wiper motor in our first model. It is fixed with the motor with the screwed bolt. The main part of the Segway is motor with is to drive the vehicle. There are total two motors for each wheels and is powered by 12V DC battery. Fig. 3.4.1: Wiper motor Battery Battery is the key source of power. Two 12v dc battery used in to power both the motor. As there battery is rechargeable so if we required to charge again it is possible to charge it again and can use it. SPDT Relay SPDT relay having terminal and 2 contacts that are normally closed and normally open. At a time one is normally closed and other is open. So in short it is worked as switch between the circuits. Fig. 3.4.2: SPDT relay Accelerometer Accelerometer is an electromagnetic module used to There are total 2 forces (I) Static (II) Dynamic. By measuring the static acceleration forces we are able to find out the angle made by Segway to earth surface. And by measuring the dynamic force we can find in which way the Segway is moving. Fig. 3.4.3: The primary sensor is gyroscope. A gyroscope is a spinning wheel inside a stable frame. A spinning object resists changes to its axis of rotation because an applied force moves along with the object itself. Fig. 3.4.4: Gyroscope We have used GY-521 module of gyroscope. This module consist the gyroscope and accelerometer, which is based on IC MPU6050. Fig. 3.4.5: Interfacing gyroscope to Arduino The channels, three for the gyroscope outputs and three for the accelerometer outputs. It can be run by using microcontroller with I2C protocol. The operating voltage range of MPU6050 is from 2.37V to 3.46V. The gyroscope output values in three directions can be converted into angular velocity in the three directions using the following equations. Pitch=GyX/131 Roll=GyY/131 Yaw=GyZ/131 Where v_pitch is the angular velocity in X axis, roll is the angular velocity in the roll(y) axis and yaw is the angular velocity in the yaw z axis. Arduino Arduino BT Arduino Nano Arduino Mini UNO Lily Pad 3.4.6: Various Arduino Board< The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughputs approaching 1 MIPS per MHz Power Supply Analog input. Digital output Arduino UNO Board Microcontroller Atmel ATmega168 or ATmega328 Operating Voltage (logic level) 5 V Input Voltage (recommended) 7-12 limits) 6-20 V Digital I/O Pins 14 (of which 6 provide PWM output) Analog Input Pins 8 DC Current per I/O Pin 40 mA Flash Memory KB (ATmega328) of which 2 KB used by bootloader SRAM 1 KB (ATmega168) or 2 KB (ATmega328) EEPROM 512 bytes (ATmega168) Speed 16 MHz Dimensions 0.73" x 1.70" Length 45 mm Width 18 mm Weight 5 g Table: Features of ATMEGA328p VCC Digital supply voltage GND Ground Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2 Port B internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Depending on the clock selection fuse settings, PB can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB7.6 is used as TOSC2.1 input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set. Port C (PC5:0) Port C is a 7-bit bi-directional I/O port internal pull-up resistors (selected for each bit). The PC5.0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri stated when a reset condition becomes active, even if the clock is not running. PC6/RESET If the RSTDISBL Fuse is programmed, PC6 is used O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is un-programmed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running Port D (PD7:0) Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running. 16 AVCC AVCC is the supply voltage pin for the A/D Converter, PC3:0, and ADC7:6. It should be externally connected to VCC, ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC6.4 use digital supply voltage, VCC. AREF AREF is the analog reference pin for the A/D Converter. ADC7:6 (TQFP and QFN/MLF Package Only) In the TQFP and QFN/MLF package, ADC7:6 serve analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels. Brakes The Segway doesn't have a http://auto.howstuffworks.com/auto-parts/brakes/brake-types/brake.htmbraking system. To stop, the rider stands upright without leaning forward or backward, and the vehicle maintains its position.

```
pinMode(12, OUTPUT); // initialize digital pin 12 as an output. pinMode(11, OUTPUT); //
digitalWrite (12, HIGH); // rotate the motor in forward direction
delay (1000); digitalWrite (11, HIGH); // rotate the motor in
digitalWrite (11, LOW); delay (1000);
relay1 =11; int relay2 =12; void setup() { Serial.begin(9600); pinMode
pinMode (relay2, OUTPUT); // initialize digital pin 12 as an output. } void loop() {
if (x=='F') digitalWrite(relay1,LOW); digitalWrite(relay2,HIGH); Accelerometer Programming #include const int MPU=0x68; // I2C address of the MPU-6050 int16_t AcX,AcY,AcZ; float a,b,c = 0; int led
int led2 =9; int led3 =10; int led4 =8; void setup() { pinMode(led1,OUTPUT); pinMode(led2,OUTPUT);
```

Wire.begin(); < Wire.beginTransmission(MPU); < Wire.write(0x6B); // PWR_MGMT_1 register < Wire.write(0); // set to zero (wakes up Wire.endTransmission(true); < B (ACCEL_XOUT_H) < Wire.endTransmission(false); < Wire.requestFrom(MPU,14,true); // request a total of 14 registers < AcX=Wire.read()&<<8|Wire.read
x3B (ACCEL_XOUT_H) & 0x3C (ACCEL_XOUT_L) AcY=Wire.read()&<<8|Wire.read(); // 0x3D (ACCEL_YOUT_H) & 0x3E (ACCEL_YOUT_L) AcZ=Wire.read Wire.read(); // 0x3F (ACCEL_ZOUT_H) & 0x40 (ACCEL_ZOUT_L) printl w } else if(b &>= 9500) { digitalWrite(led4,HIGH); HIGH); digitalWrite(led3,HIGH); Serial.write('3');
led4,HIGH); Serial.write('4'); delay(50); } LOW); digitalWrite(led4,LOW); delay(50); command acceptance easily. To provide good efficient self-balancing system. To provide low energy is consumption and taking a solar energy used. To
provide Facility by giving different types of input command. To provide proper scheduling and guidance which are simple to follow. To provide easy and user friendly mechanism, which can be easily implemented. 5.2 Usefulness with respect to existing solutions Problem and mechanism The previous mechanism have taken over one of the difficulty i.e. reduce the efforts which was needed previously for moving segue. in used motor speed is very high that's way to generated the jerk. Jerk is effected to the balancing his the big problem of our project. For the joy stick input module person have to manage the movement of segue with the help of their hands is possible for that and easily segue is handle. And same goes for the accelerometer. So our project we have tried to concentrate on how to overcome those challenges. Requirement of new mechanism those challenges can be overcome by selecting the worst case i.e. developing such segue which accepts input from the movement of human lag or hand and follow the command accordingly. This technique includes the controller. With this technique we can convert bio signal to electrical and follow further procedure. Proper Hardware and software interfacing is to be done. 5.3 Scope of Future work Since those challenges can selecting the worst case i.e. developing such segue which accepts input from the movement of human eye and follow the command accordingly. This technique includes the image processing. With this technique we can convert bio signal to electrical and follow further procedure. Proper Hardware and software interfacing is to be done. Till now, segue were made that accepts the command in different ways but in our project input is given with the help of joystick (hand). As the movement of hand (joystick) will be done, command will be provided to segue and motion of segue is done. We will develop the original working model of segue in future academic year. But there are some features which we can add in our project. There can be advanced motor assembly which can sense the barrier and take the appropriate decision without taking help of the person using the system. And similarly such safety measures will be taken by detecting for any people. We can also make necessary changes in hardware and use segue on the garden area. In this manner we can make necessary changes and give whatever advancement as per the user requirement. Self-balancing accuracy is created properly and make a robust system for any people in day to day life in used. 5.4 The Unique feature of project This invention relates of robotics design. Segue which we are going to design will provide easiness to the any person. This system replaces current old age technology with modern era techniques such as giving command with hand movement, keeping advanced self-balancing detection sensors and many such privilege as per the patients need.

futureofmechnical.blogspot.com/

http://saba.kntu.ac.ir/eecd/ecourses/instrumentation/projects/reports/Poly%20Gyroscope/Applications/Segway%20%20How%20it%20Works.htmhttp://saba.kntu ac.ir/eecd/ecourses/instrumentation/projects/reports/P http://saba.kntu.ac.ir/eecd/ecourses/instrumentation/projects/reports/Poly%20Gyroscope Applications/Segway%20%20How%20it%20Works.htmoly%20Gyroscope/Applications/Segway%20%20How%20it%20Works.htm

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What progress you have made in the project? Designed and implemented the basic model of Segue and made it working using Accelerometer and gyroscope and created the relay board circuit. What challenge you have faced? We have faced problems in the following sections. Designing of the chassis and Balancing. Making Viper Motor run but problem is very high speed to start that way to balancing is disturb. Understanding the current capacity of
Relays required for Wiper Motors. What support you need? We have received guidance for guide to the system balancing purpose. We have also received guidance to design programming of accelerometer and gyroscope. What literature you have referred? We have referred the following references for our project Arduino.cc ? Instructables.com Handbook for Arduino. SEGWAY Personal Transporter (PT). A.2: Second PPR What Progress you have made in Project? Designed and implemented the basic model of Segue and made it working using Accelerometer and gyroscope and created the relay board circuit Designed is connected to the battery and other circuits and check the design is working properly or not and design is work properly. What challenge
you have faced? We have faced problems in the following sections. Designing of the chassis and Balancing. When the motor starts running it gives large amount of jerk because of that unbalancing take place. Understanding the current capacity of Relays required for Wiper Motors. What support you need? We have received guidance for guide to the system balancing purpose. We have also received guidance to design programming of accelerometer and gyroscope. Which literature you have referred? Arduino.cc ? Instructables.com Handbook for Arduino. SEGWAY Personal Transporter (PT). Operating Characteristics of the Segway Human Transporter. A.3: Third PPR What Progress you have made in the Project? Design a canvas and upload in GTU PMMS Site. Our project related patent search and prepare a PSAR Then upload in GTU PMMS Site. What challenge w:We have faced problems in the following sections. When the motor starts running it gives large amount of jerk because of that unbalancing take place. Many site check and prepare proper related to our project patent has finned. We had filled maximum of data related to our project in canvas sheet. What support you need? guidance to design a hardware modification. Which literature you have referred? Arduino.cc SEGWAY Personal Transporter (PT) Operating
Characteristics of the Segway Human Transporter ? Patent study Literatures review Arduino.cc Segway
Characteristics Of The Segway Human Transporter Instructable.com Handbook of Arduino Segway Design Project Two wheel self-balancing robot Patent Search Done Includes Low-profile two-wheeled self-balancing vehicle with exterior foot platforms- us8684123 Two-wheeled self-balancing motorized personal vehicle with tilting wheels- us 9045190 b2 Vehicle forming self-balancing human transporter with an integrated photovoltaic module us 8978791 b2 Personal transporter- us 6796396 b2 Two wheeled self-balancing motorized personal vehicle with tilting wheels- us20130032423 a1 wheel self-balancing vehicle with independently movable foot placement sections- us 8738278 b2 Segway, two wheel self-balance vehicle, two wheel electrical device - us 7962256 b2 Two wheel battery powered vehicle- wo2012136798 a1 Conversion assembly to be applied to a "Segway" or transporter- wo2012017335 a1 Self-powered folding golf cart- us 4106583 a Apparatus and methods for control of a vehicle- us7958961 b1 Speed limiting in electric vehicles- us 7962256 b2 Human powered and electricity balanced personal vehicle- us 8162089 b2 Speed limiting in electric
Speed limiting in electric vehicles- ep2049963 a2 Self-propelled golf cart- us 3812929 a Self-propelled vehicle- us 5011171 a Conversion assembly to be applied to a "Segway" or the like transporter- ep2601093 b1 Speed limiting in electric vehicles- us 6874591 b2 Apparatus and methods for
of a vehicle- us20140222267 a1 3 | P a g e

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120030117018	Patel Priyanshu B.	
120030117022	Vyas Bhrugu V.	
120030117005	Rupareliya Stavan Y.	

Place: Date:

Name of Guide Signature of Guide

ABSTRACT

The world is growing fast in technologies without considering the effects to the nature. People started using hi-tech technologies in their day to day life and becoming crazy behind the systems which make their life easy. It is always difficult to exactly understand the needs and live accordingly. In today's world many systems are installed in the vehicles for our use. Now-a-days vehicles are becoming the primary need for any person. But as this usage of vehicles increases, it may also increase the pollution in the environment.

As per the statistics we have observed through various online resources we have produced the same amount of CO2 after 1970 as we have produced in 6500 years before 1970. Different types of fuels are being used in vehicles which is a non-renewable source. It is highly demanding as far as the existence of earth is concerned, we should divert our focus towards the renewable energy sources and vehicles which are compact in size and uses almost no fuel who is the cause behind the CO2 emission.

Now-a-days researchers are finding another option in place of fuels for vehicles. With the same curiosity and care for the mother earth we are planning to design a small vehicle which works on the Solar Energy. The compact size of the "SEGUE" leads to an efficient use of energy and space as well. "SEGUE" is a two wheeler designed for the travelling of a single person and we can make it flexible so that user can park it in minimum space.

CHAPTER-1

PROJECT INTRODUCTION

- Segway is the Hi-Tech scooter which is used to move from one place to another place. It is like a scooter so it consisting of two wheel but both the wheels are parallel to each other that are placed side by side.
- To move forward or backward on the Segway, the rider used to lean slightly forward or backward using handlebar and to turn left or right the rider turns the handlebar in right or left side. The balancing act is most amazing and interesting thing about the Segway, and it is the key operation to ride it.

Basic Principle

- The basic principle behind the working operation is comes from in our body operation. If we stand up and lean forward, we will out of balance, and we probably will fall on upon ours face. But our brain knows that we are out of balance, because of fluid in your inner ear shifts, so it triggers us to put ours leg forward and stop the fall. If we keep leaning forward, our brain will keep putting our legs forward to keep us upright. Instead of falling, we will walk forward, one step at a time.
- The Segway also does same things. Instead of legs it has wheels, a motor instead of muscles, a collection of microprocessors and microcontrollers instead of a brain and a set of sophisticated tilt sensors instead of an inner-ear for balancing system. Like our brain, the Segway knows when we are leaning forward. To maintain balance, it turns the wheels at just the right speed, so we move forward.

1.1 Problem summary

- The first problem with the Segue is the price. This technology is not reasonable to low-income individuals. The vast market for the Segue would be college students, however, this market has not been tapped into. University campuses are usually huge and getting from one class to the next and aft to dormitories can be a long distance when one has to walk, but college students cannot afford to buy the Segue for their use. The solution to this problem is for manufacturers to use nominal but safe technology in order to decrease the price. A second issue is lack of advertising; few people know about Segway dealerships, the cost and the great invention that it is, the solution would be to advertise more. The Segue is not only a great latest thing , but it is also environmental friendly since it is fully electrical and does not release any emissions and this would appeal to a lot of people if they knew it existed. The final problem with the Segue is that the technology is so new and when it breaks down the manufacturers are forced to recall all Segues and this

can be valuable. Unlike cars where there is an abundant of mechanics to fix them when they break down, the Segue does not enjoy the same benefit, the solution to this problem would be to provide users with very simplified manuals and an excellent technical support team that can be easily reached by dialing a toll free number.

- The Segue has probably bright future, because after most of the problems are taken care of, it will eventually be widely used and accepted as a form of transportation that is better than the bicycle. Some of the progress in the future would be the addition of an umbrella that is attached to the handlebars and can be opened at a touch of a button. Segues will be converted to transport more than one person, there will be room for a passenger. Also, the manufacturers will make smaller Segues for young kids, Segues with more tractable covers to shield the user from bad weather and proper nightlights so it can be safely used twenty four hours a day. Lastly, when the Segway is widely used there will have to be Segue lanes for the riders.

1.2 Aim and Objective of the Project

- Segue is very expensive now a days. That's why common people can't use it. In a country like India where rich people are less in number compared to middle class and low class people, it is not preferable. If it available for low cost it will be preferred by all. That is the ultimate aim of our project. The makes Segue with a cost around of Rs 30,000/-. We named it as segue or human transporter or homemade segue. Our country people phase the "walking problem". In addition, they also appeared set on solving the "bicycling problem." The Segue can best be compared to the unicycle. It even looks a bit like one. In Segue used the gyroscope and accelerometer for the solved many problem of self-balancing.
- Segue is easily handle and low parking space is required. Its product in the less pollution. Our design work in the solar energy. Solar energy is renewable and easily getting in the morning. This energy is free of cost is used and this benefit is plus point of segue cost. Segue in less pollution because this design in not used any fuel. Our project is eco-friendly and all people is easily used.

1.3 Problem Specification

- The numbers of persons who are golf player dependent on others servant or a big car that's way only used a new technology and easily go with any place of garden and paly game.
- Rich people doesn't like to walking long distance so the used segue for our walking.
- Parking space is no more so the people phase problem of parking that time segue is used.

- The current mechanism includes many new changes as compare to classical approach. In classical approach person need to give more efforts for having mobility and which is much tiresome and sometimes need person for their help.
- But now a days this things are replaced by new techniques. With the help of hardware and software those efforts were diminished by providing different inputs or command which can easily move segue. Those different inputs are joy stick, touchpad, accelerometer etc.

1.4 Prior Art Search (PAS)

- Now a days we can see rich people have main problem of mobility. So we came with an idea of Smart segue which can help them to remove this deficiency.
- We have visited Mall, Garden, Playground and talk with people and took different suggestion. Also we talk with people who are facing disability.
- And then we have started to search the solution of this actual problem.
- For this we have taken help from college and project guide.
- Then we have started to find the patents related to this innovation.

Patent Search:

- www.worldwide.espacenet.com
- www.freepatentsonline.com
- www.ipindia.nic.in

Web Search

- www.arduino.com / datasheet.
- www.instructables.com
- www.alldatasheet.com

1.5 Plan of work

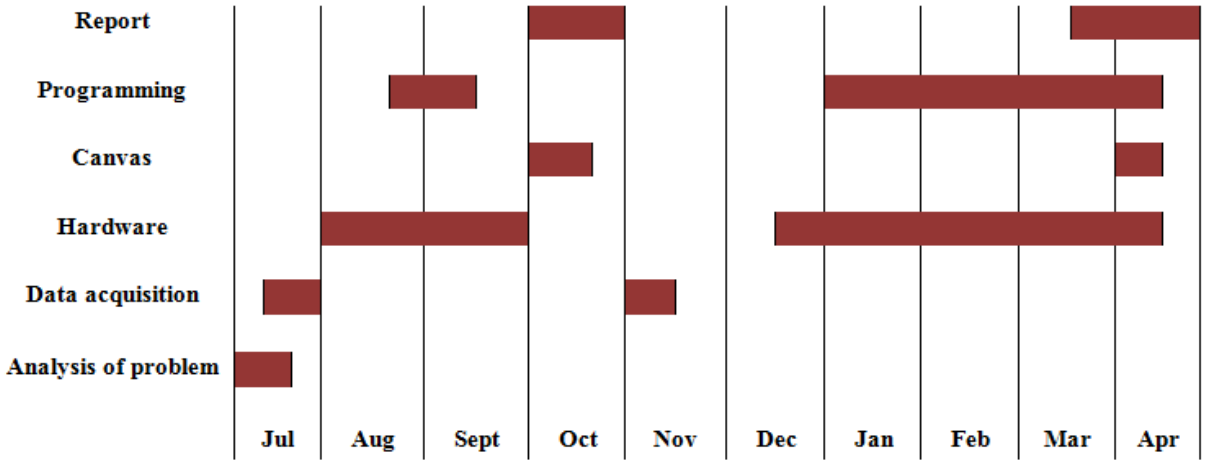

Fig. 1: Plan of the work

1.6 Materials and Tools Requirement

1.6.1 Material/ Components

- Chassis
- Motor
- Battery
- Relay
- Accelerometer
- Gyroscope
- Controller

1.6.2 Tools/Equipments

- Welding Machine.
- Cutter.
- Radial drill.
- Grinder.
- Hydraulic Press.
- Soldering iron.

1.7 Component Description

1. Chassis

- Chassis is mainly made up of wooden plate which is supported by iron plate. We had made iron plate by keeping place to adjust wooden plate which is used in to stand upon it. By screw and nut system the wooden plate is supported on iron plate. Wheels are attached with the motor and is placed in middle part of the chassis. The handlebar is made of steel rod and is fixed using clam

2. Motor

- We have used wiper motor in our first model. It is fixed with the motor with the screwed bolt. The main part of the Segway is motor with is to drive the vehicle. There are total two motors for each wheels and is powered by 12V DC battery.

Fig. 2: Wiper motor

3. Battery

- Battery is the key source of power. Two 12v dc battery used in to power both the motor. As there is a dc battery is rechargeable so if we required to charge again it is possible to charge it again and can use it.

4. SPDT Relay

- SPDT relay having one common terminal and 2 contacts that are normally closed and normally open. At a time one is normally closed and other is open. So in short it is worked as a switch between the circuits.

Fig. 3: SPDT relay

5. Accelerometer

- Accelerometer is an electromagnetic module used to measure acceleration forces. There are total 2 forces (I) Static (II) Dynamic. By measuring the static acceleration forces we are able to find out the angle made by Segway to the earth surface. And by measuring the dynamic force we can find in which way the Segway is moving

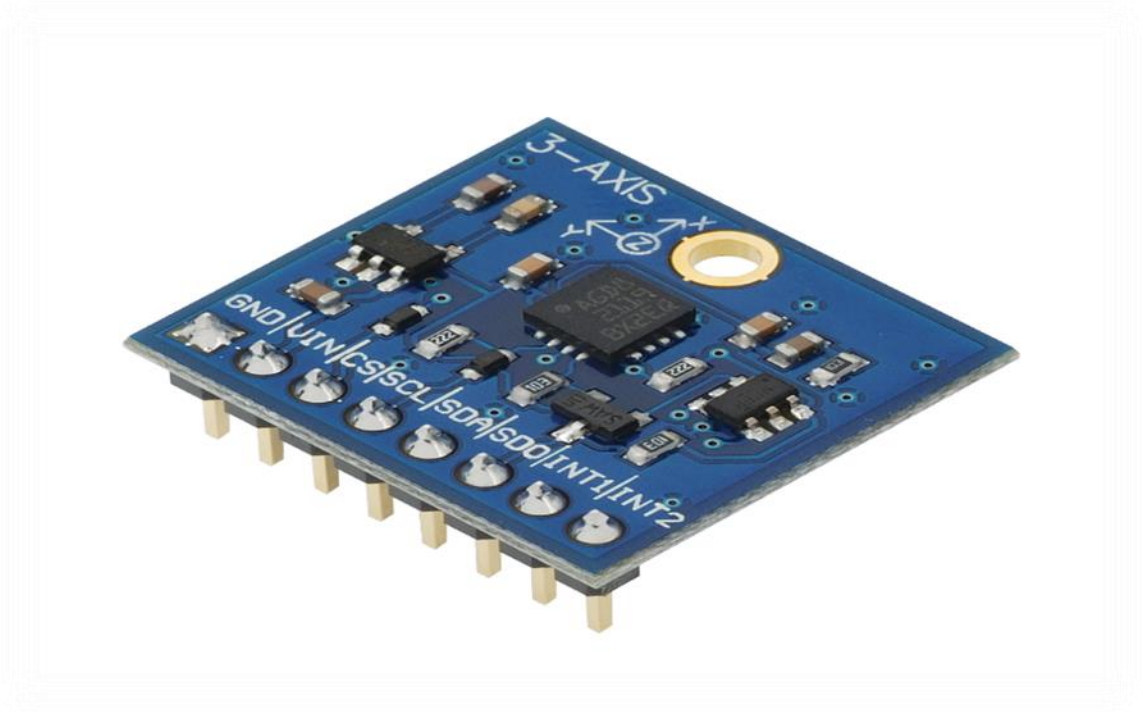

Fig. 4: Accelerometer + Gyroscope (MPU6050)

6. Gyroscope

- The primary sensor is gyroscope. A gyroscope is a spinning wheel inside a stable frame. A spinning object resists changes to its axis of rotation, because an applied force moves along with the object itself.
- We have used GY-521 module of gyroscope. This module consist both the gyroscope and accelerometer, which is based on IC MPU6050.

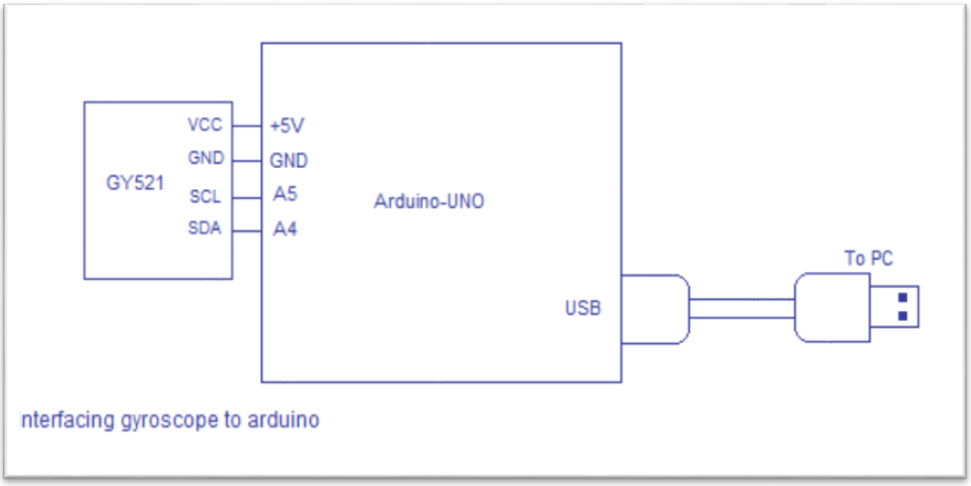

Fig. 5: Interfacing gyroscope to Arduino

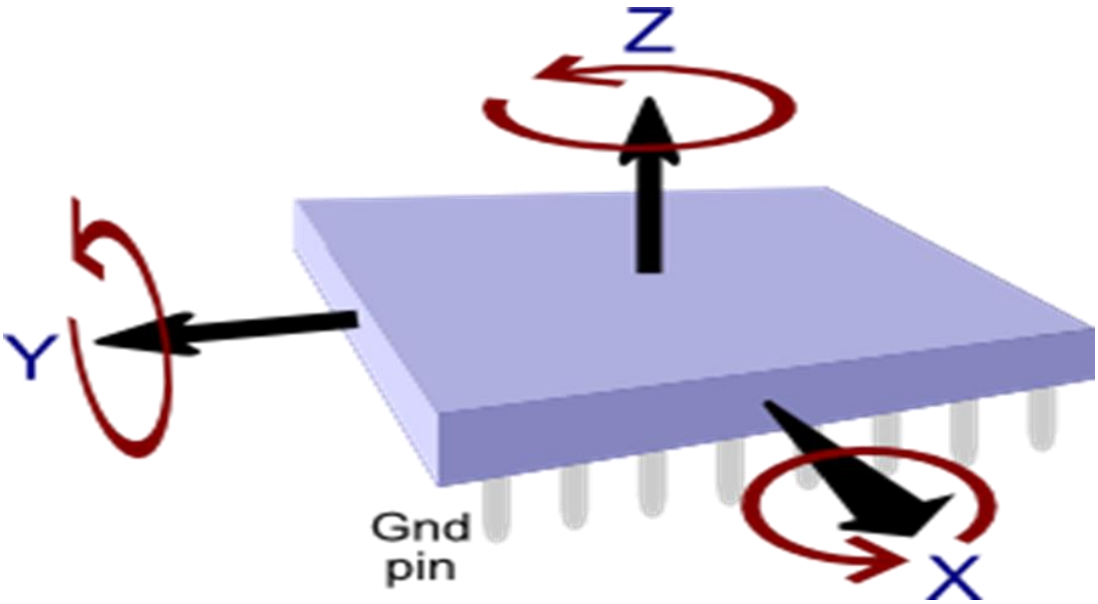

Fig. 6: Gyroscope

- The MPU6050 has 6 inbuilt 16 bit ADC channels, three for the gyroscope outputs and three for the accelerometer outputs. It can be run by using microcontroller with I2C protocol. The operating voltage range of MPU6050 is from 2.37V to 3.46V. The gyroscope output values in three directions can be converted into angular velocity in the three directions using the following equations.
  Pitch=GyX/131
  Roll=GyY/131
  Yaw=GyZ/131
- Where v_pitch is the angular velocity in X axis, roll is the angular velocity in the roll(y) axis and yaw is the angular velocity in the yaw z axis.

7. Arduino

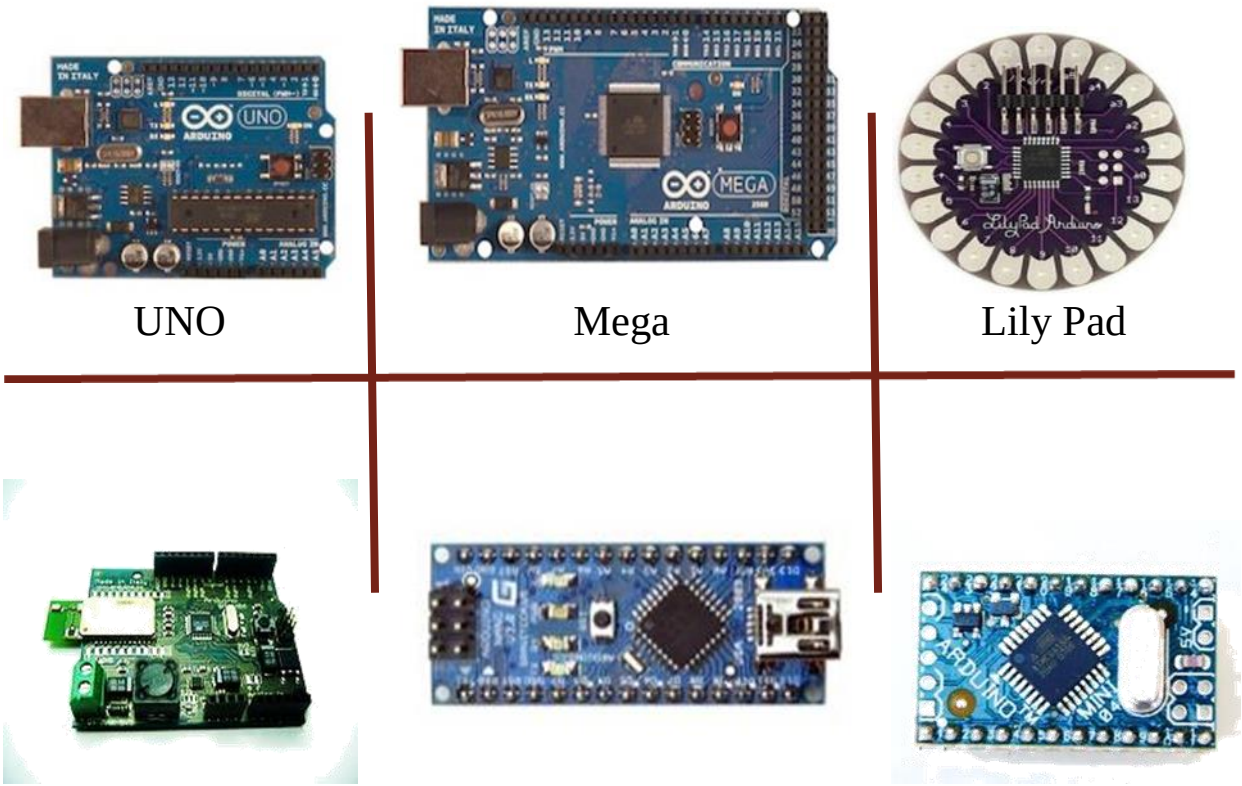

Fig. 7: Various Arduino Board

- The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughputs approaching 1 MIPS per MHz

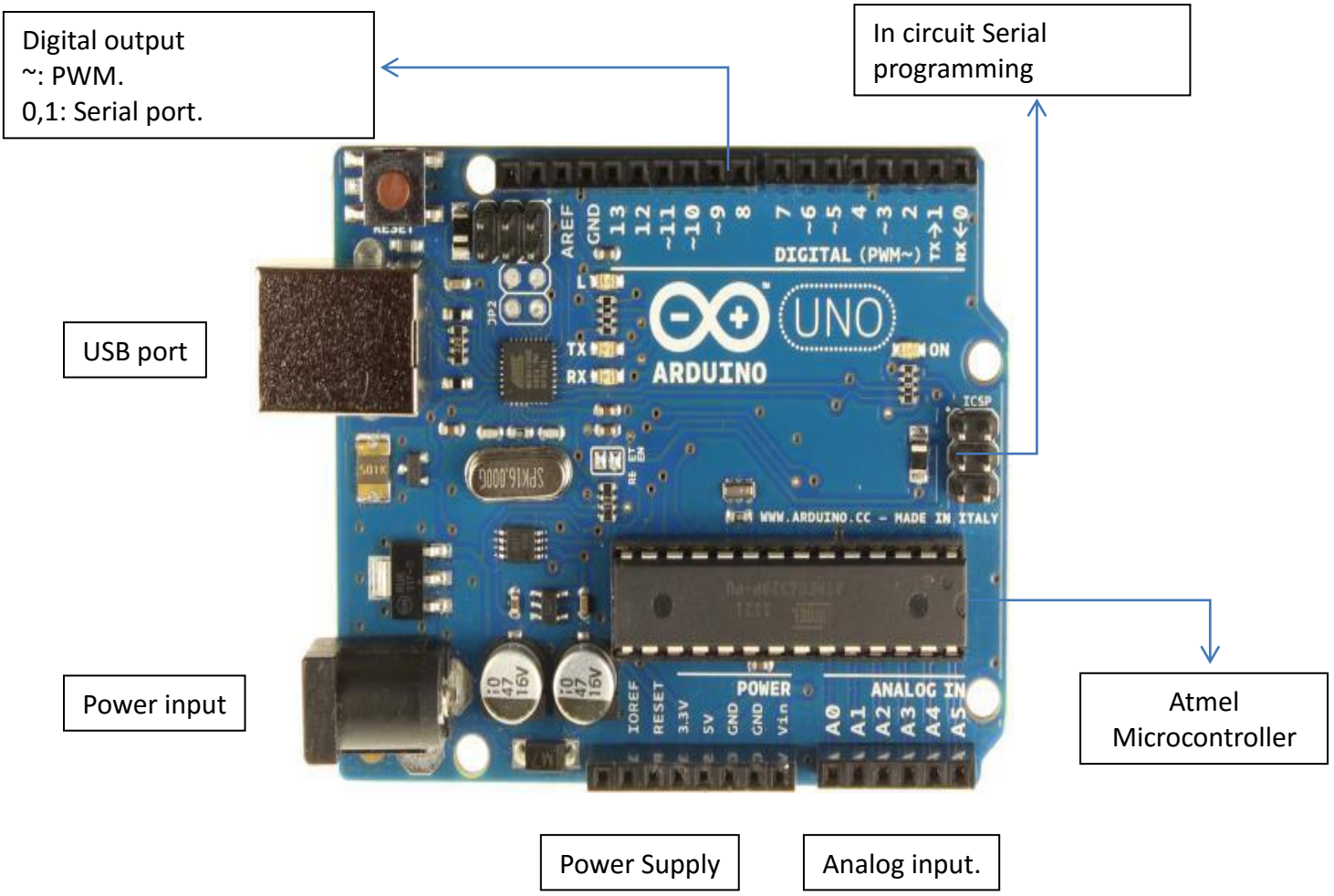

Fig. 8: Arduino UNO Board

Microcontroller	**Atmel ATmega168 or ATmega328**
Operating Voltage (logic level)	**5 V**
Input Voltage (recommended)	**7-12 V**
Input Voltage (limits)	**6-20 V**
Digital I/O Pins	**14 (of which 6 provide PWM output)**
Analog Input Pins	**8**
DC Current per I/O Pin	**40 mA**
Flash Memory	**16 KB (ATmega168) or 32 KB (ATmega328) of which 2 KB used by bootloader**
SRAM	**1 KB (ATmega168) or 2 KB (ATmega328)**
EEPROM	**512 bytes (ATmega168) or 1 KB (ATmega328)**
Clock Speed	**16 MHz**

Dimensions	**0.73" x 1.70"**
Length	**45 mm**
Width	**18 mm**
Weight	**5 g**

Table-1: Features of ARDUINO

Pin Description

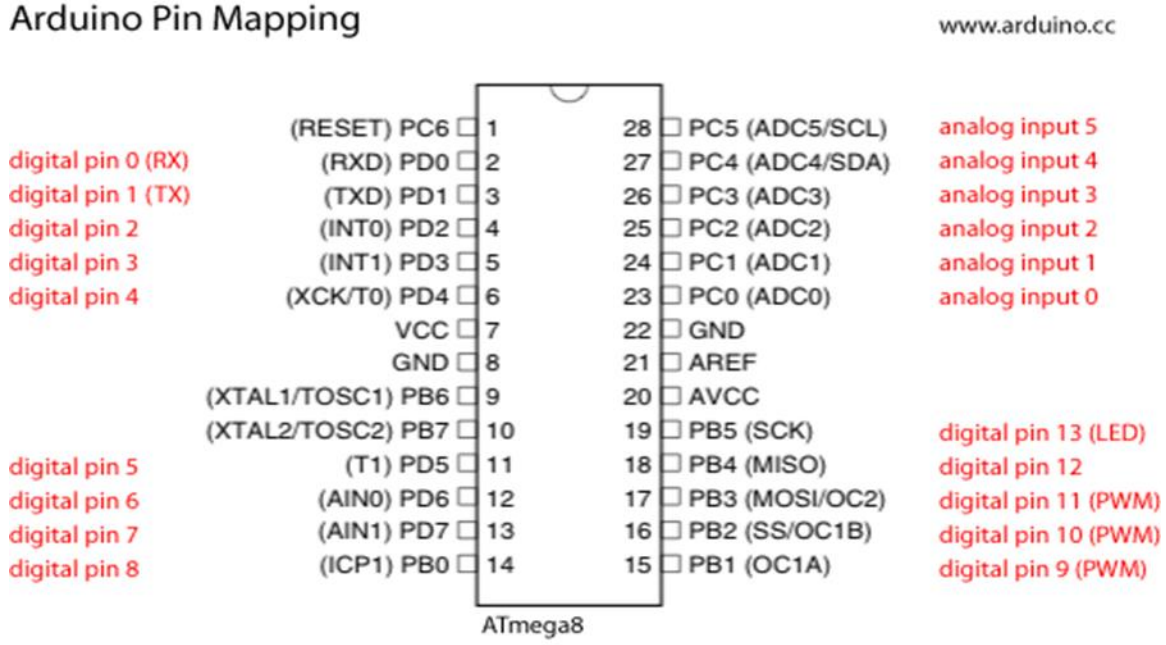

Fig.9: Pin diagram of ATMEGA328p

1. **VCC**
- Digital supply voltage

2. **GND**
- Ground

3. Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2

- Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB7.6 is used as TOSC2.1 input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

4. Port C (PC5:0)

- Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5.0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

5. **PC6/RESET**

- If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is un-programmed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running.

6. **Port D (PD7:0)**

- Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source

current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running. 16

7. **AVCC**

- AVCC is the supply voltage pin for the A/D Converter, PC3:0, and ADC7:6. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC6.4 use digital supply voltage, VCC.

8. **AREF**

- AREF is the analog reference pin for the A/D Converter.

9. **ADC7:6 (TQFP and QFN/MLF Package Only)**

- In the TQFP and QFN/MLF package, ADC7:6 serve as analog inputs to the A/D converter.

  These pins are powered from the analog supply and serve as 10-bit ADC channels.

1.8 SOFTWARE DESCRIPTION

Arduino

- Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world. Arduino boards may be purchased preassembled, or as do-it-yourself kits; at the same time, the hardware design information is available for those who would like to assemble an Arduino from scratch.

- The project is based on a family of microcontroller board designs manufactured primarily by Smart Projects in Italy, and also by several other vendors, using various 8-bit Atmel AVR microcontrollers or 32-bit Atmel ARM processors. These systems provide sets of digital and analog I/O pins that can be interfaced to various extension boards and other circuits. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino platform provides an integrated development environment

(IDE) based on the Processing project, which includes support for C and C++ programming languages.

- The first Arduino was introduced in 2005. The project leaders sought to provide an inexpensive and easy way for hobbyists, students, and professionals to create devices that interact with their environment screenshot of the Arduino IDE showing the "Blink" program, a simple beginner program.

Developer(s)	:	Arduino Software
Stable release	:	1.6.3 / 2 April 2015
Written in	:	Java, C and C++
Operating system	:	Cross-platform
Type	:	Integrated development environment
License	:	LGPL or GPL license
Website	:	Arduino.cc

CHAPTER-2

Design: Analysis, Design Methodology and Implementation Strategy

2.1 AEIOU Summary

- **Activities**: Visit, Meeting, Discuss Idea, Research Idea, Gather Idea.
- **Environment**: Resource Use, Air Pollution, Waste, Noise Pollution, Land Take, Climate Change.
- **Interactions**: Professor to Student, Student to Student, Manager to Employer, Event coordinator to Student.
- **Objects**: Motor Assembly, Chassis, Battery, Joystick, AR-Tactile, Sensor Gyroscope.
- **Users**: Manager, Engineer, Rich People, Sport Person, Corporative member, Student, Tourist Guide.

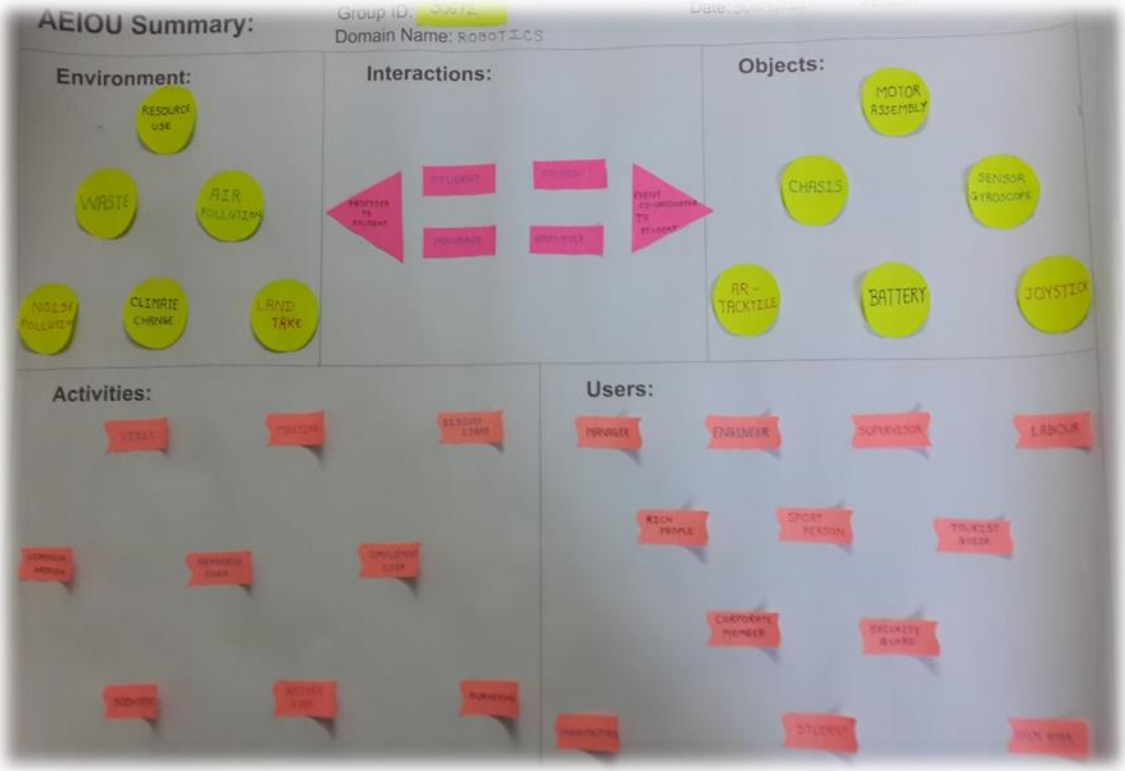

Fig. 10: AEIOU CANVAS

2.2 Ideation canvas:

All these points were covered in this canvas it focused on the people being influenced by the project, Activities to be done to achieve the milestones. “What is the best way to describe the necessary actions? Does each action have a direct link to one or more of the outcomes? Are the actions detailed enough to develop a project plan?” all these questions were answered by various teams in their ideation canvas in props/possible solutions. Schematic shows the typical ideation canvas sample.

- **People**: Manager, Engineer, Rich People, Sport Person, Corporative member, Student, Tourist Guide
- **Activities**: Low power consumption, Avoided Accident, Robust System, Fuel Saving, Quick Operation
- **Situations/context/location**: Controlling Speed, Save Life, Garden, in mall, On the Road, Tourist place, Technical Event.
- **Problems/ possible solution**: Better speed motor, SPDT relay, Different Model, Multipoint Control, High Accurate Sensor, Compact size, Low cost.

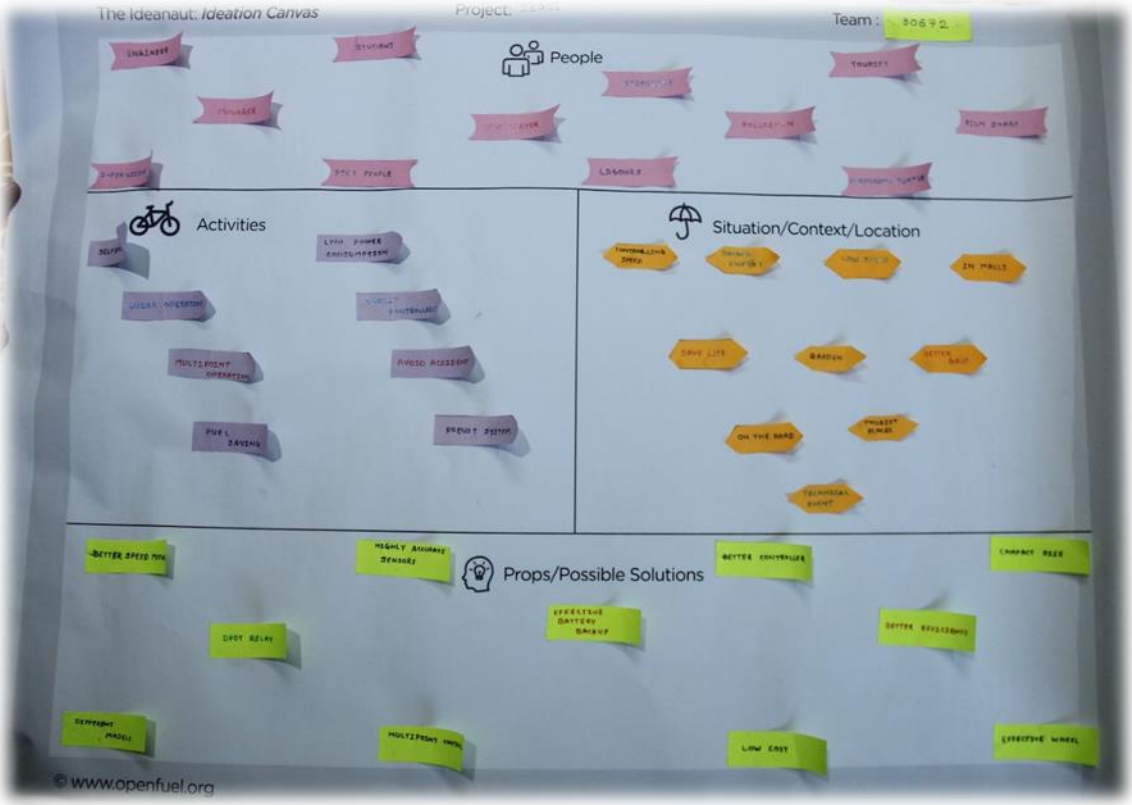

Fig.11: IDEATION CANVAS

2.3 Empathy Mapping Canvas:

- User: Manager, Engineer, Rich People, Sport Person, Corporative member, Student, Tourist Guide
- Stakeholders: Manager, Engineer, Rich People, Student
- Activities: Self Balancing, Controlling speed, Better grip over wheel, Fuel saving, less power consumption, easily controlling.
- Story Boarding: Related to project

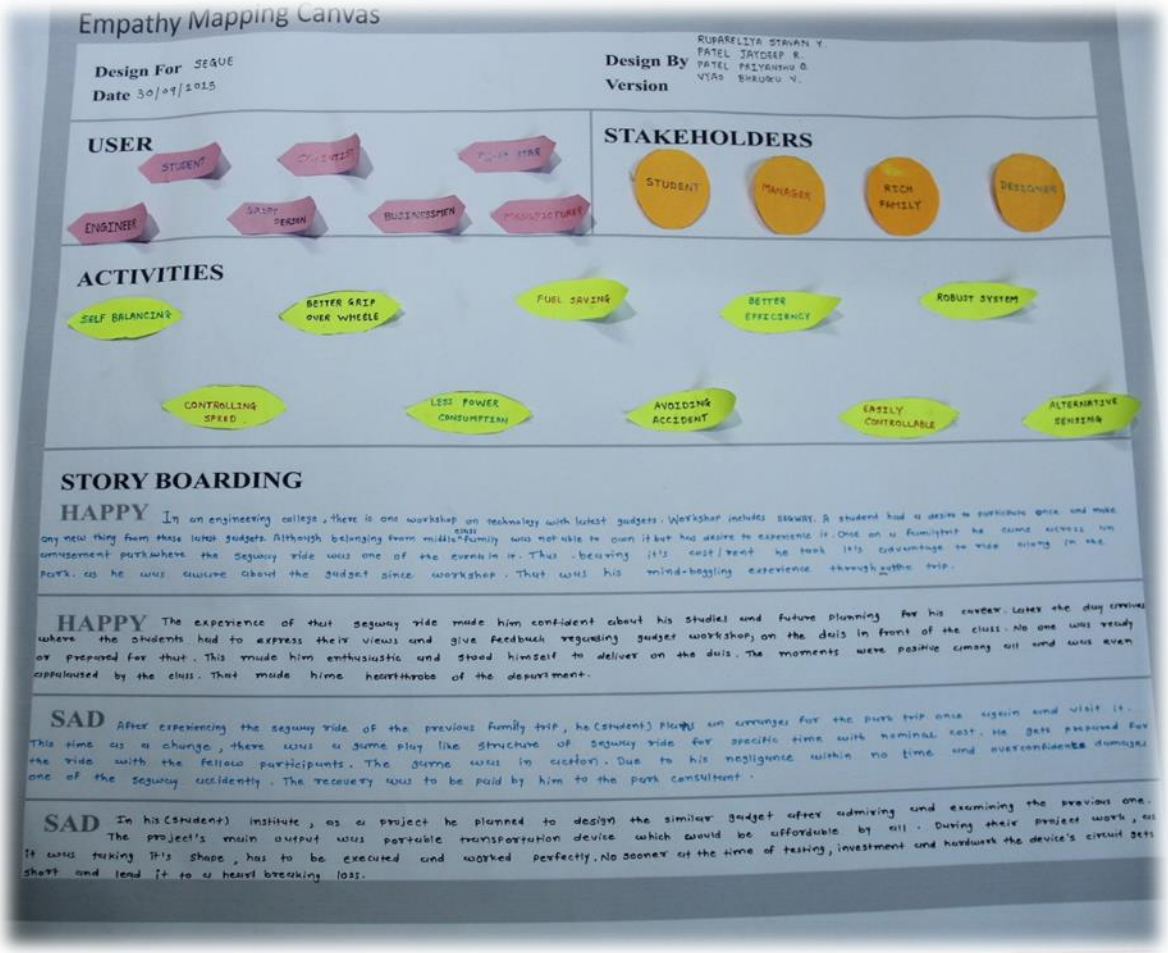

Fig.12: EMPATHY CANVAS

2.4 Product Development Canvas:

- Purpose: Over low speed, Technology used in day to day life.
- People: Manager, Engineer, Rich People, Sport Person, Corporative member, Student, Tourist Guide
- Product experience: In this we provide self-mobility by giving advanced facilities.
- Product functions: Self Balancing, Robust system, super compact body, Good performance, controlling speed.
- Product feature: Medium Weight, Compact size, Zero Turning Radius, Quick Operation, Eco-friendly.
- Components: Chasse, motor, Arduino Nano, Gyroscope, Wire, Relay, Wheel, and Battery.
- Customer revalidation: user friendly design, add any new navigator system, increase speed.
- Retain/ Redesign/ Reject: implement uln2003 for control relay, rejected Bluetooth system, Expensive vehicle, Used in a specific area.

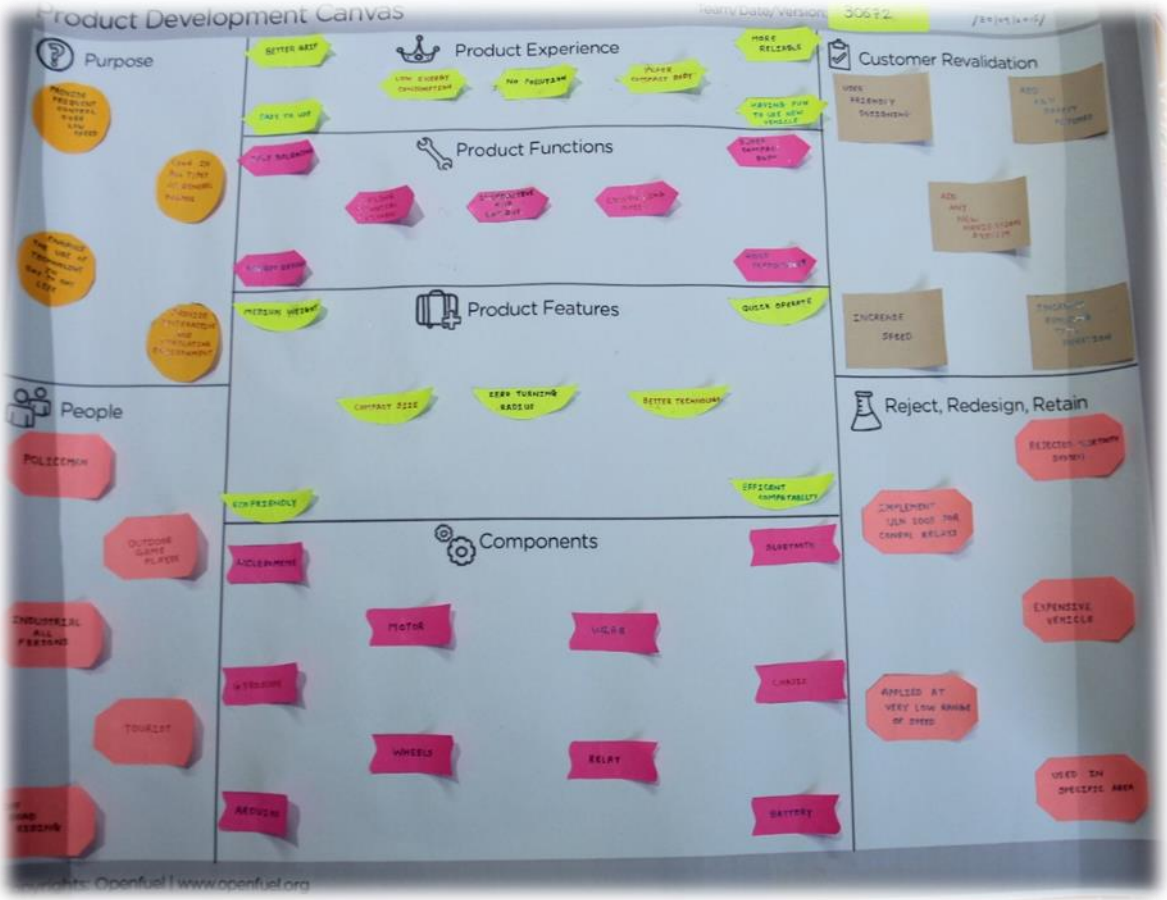

Fig.13: PRODUCT DEVELOPMENT CANVAS

2.5 BUSINESS MODEL CANVAS

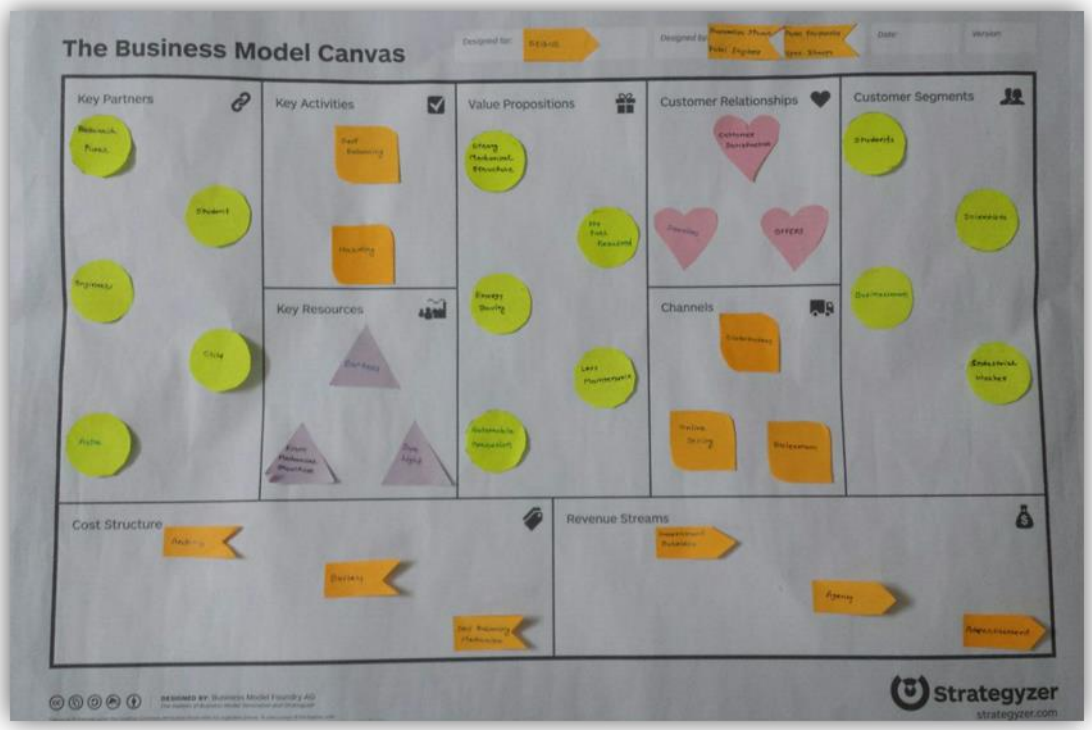

Fig.14: BUSINESS MODEL CANVAS

CHAPTER-3

PROJECT IMPLEMENTATION

3.1 Block Diagram

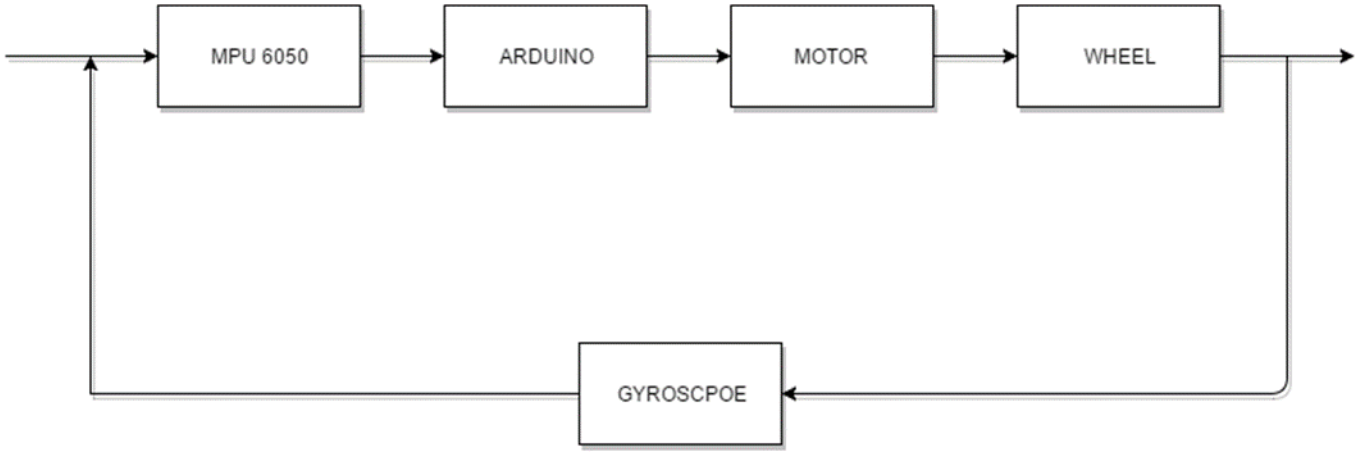

Fig.15: Block Diagram

- In any system input is first required. We are giving the input to the Segway by handlebar which is working as a joystick. Accelerometer is fixed with the handlebar. Accelerometer is main part of the system and work as a sensor. Accelerometer will generate the signal and it will pass that signal to the controller. We have used Arduino as controller. As Arduino work only at 5V we have to use voltage regulator power supply. We have use relay circuit to drive motor. Both the wheels are fixed with the motor. So when the controller gives the signal to the motor, motor will rotate according to it and connected wheels will rotate. So as the handlebar move according to that accelerometer generate the signal that will pass to the controller, controller takes any action and that signal given to the wheels through the motor.

3.2 Working of project

- We are making this project for commercial use. In this two wheeler vehicle there is much complexity.
- There is two wheel fixed with two motor which are powered by 12V DC battery.

- We have placed tilt sensors for balancing purpose which will give its output signal to the motor and it will rotate following to that signal.
- We have used an accelerometer module to use handlebar as a joystick. We have placed it at the handlebar and as it moves forward the segue will move in forward direction. Similarly it will move in all four direction as handlebar will move.
- For balancing purpose we are going to use gyroscope as a tilt sensor which will generate output signal when it will goes unbalance. That signal is applied to the motor and it will rotate following to the signal.

3.3 Circuit Diagrams and Explanation Counter Circuit

Relay Circuit

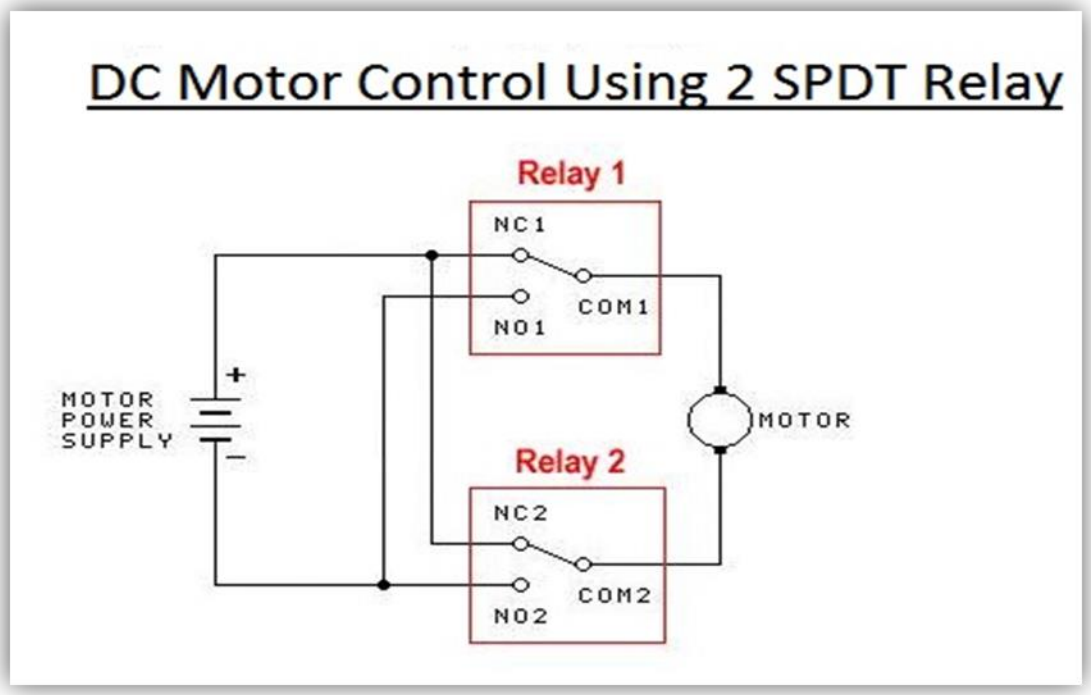

Fig. 16: DC motor control using SPDT relay

- The Single Pole Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit "receives" current, the other one doesn't and when the coil gets energized the opposite is happening.

3.4 Programming of Arduino [1]

3.4.1 Clockwise-Anticlockwise Motor Using Relay

```
void setup()
{
  pinMode(12, OUTPUT);      // initialize digital pin 12 as an output.
  pinMode(11, OUTPUT);      // initialize digital pin 11 as an output.
}

void loop()
{
  digitalWrite (12, HIGH);     // rotate the motor in forward direction
  delay (1000);                  // wait for a second
  digitalWrite (12, LOW);
  delay (1000);
  digitalWrite (11, HIGH);    // rotate the motor in reverse direction
  delay (1000);                 // wait for a second
  digitalWrite (11, LOW);
  delay (1000);                 // wait for a second
```

3.4.2 Serially control of Motor clockwise –anticlockwise

```
int relay1 =11;
int relay2 =12;
void setup()
{
  Serial.begin(9600);
  pinMode (relay1, OUTPUT);          // initialize digital pin 11 as an output.
  pinMode (relay2, OUTPUT);          // initialize digital pin 12 as an output.
}
void loop()
{
  if(Serial.available()>0)
  {
    int x= Serial.read();
```

```
        if (x=='F')
        {
          digitalWrite(relay1, HIGH);
          digitalWrite(relay2, LOW);
        }
        else if (x=='R')
        {
         digitalWrite(relay1,LOW);
         digitalWrite(relay2,HIGH);
        }
       else
       {
          digitalWrite(relay1,LOW);
         digitalWrite (relay2,LOW);
       }
    }
}
```

3.4.3 Accelerometer Module Programming

```
#include<Wire.h>
const int MPU=0x68;  // I2C address of the MPU-6050
int16_t AcX,AcY,AcZ;
float a,b,c = 0;
int led1 =11;
int led2 =9;
int led3 =10;
int led4 =8;
void setup()
{
  pinMode(led1,OUTPUT);
  pinMode(led2,OUTPUT);
  pinMode(led3,OUTPUT);
  pinMode(led4,OUTPUT);
  Wire.begin();
```

```
  Wire.beginTransmission(MPU);
  Wire.write(0x6B);  // PWR_MGMT_1 register
  Wire.write(0);     // set to zero (wakes up the MPU-6050)
  Wire.endTransmission(true);
  Serial.begin(9600);
 }
 void loop()
{
  Wire.beginTransmission(MPU);
  Wire.write(0x3B);  // starting with register 0x3B (ACCEL_XOUT_H)
  Wire.endTransmission(false);
  Wire.requestFrom(MPU,14,true);  // request a total of 14 registers
  AcX=Wire.read()<<8|Wire.read();  // 0x3B (ACCEL_XOUT_H) & 0x3C (ACCEL_XOUT_L)
  AcY=Wire.read()<<8|Wire.read();  // 0x3D (ACCEL_YOUT_H) & 0x3E (ACCEL_YOUT_L)
  AcZ=Wire.read()<<8|Wire.read();  // 0x3F (ACCEL_ZOUT_H) & 0x40 (ACCEL_ZOUT_L)
  Serial.print("AcX = "); Serial.println(AcX);
 Serial.print(" | AcY = "); Serial.println(AcY);
  float a = AcX;
  float b = AcY;
 delay(1000);
  if(b <= -9500)
  {
   digitalWrite(led1,HIGH);
   Serial.write('1');
  delay(50);
  }
  else if(b >= 9500)
  {
   digitalWrite(led4,HIGH);
   Serial.write('2');
   delay(50);
  }
```

```
 else if(a <= -9500)
 {
  digitalWrite(led2,HIGH);
  digitalWrite(led3,HIGH);
  Serial.write('3');
  delay(50);
 }
else if(a >= 10000)
 {
  digitalWrite(led1,HIGH);
 digitalWrite(led4,HIGH);
  Serial.write('4');
  delay(50);
 }
 else
 {
    digitalWrite(led2,LOW);
    digitalWrite(led1,LOW);
    digitalWrite(led3,LOW);
    digitalWrite(led4,LOW);
    delay(50);
  }
}
```

3.4.4 Gyroscope Module Programming

```
#include<Wire.h>
const int MPU=0x68;  // I2C address of the MPU-6050
int16_t AcX,AcY,AcZ,GyX,GyY,GyZ;
float a,b,c = 0;
int led1 =11;
int led2 =9;
int led3 =10;
int led4 =8;
void setup()
{
 pinMode(led1,OUTPUT);
 pinMode(led2,OUTPUT);
```

```
  pinMode(led3,OUTPUT);
  pinMode(led4,OUTPUT);
  Wire.begin();
  Wire.beginTransmission(MPU);
  Wire.write(0x6B);  // PWR_MGMT_1 register
  Wire.write(0);     // set to zero (wakes up the MPU-6050)
  Wire.endTransmission(true);

  Serial.begin(9600);
}
void loop(){
  Wire.beginTransmission(MPU);
  Wire.write(0x3B);  // starting with register 0x3B (ACCEL_XOUT_H)
  Wire.endTransmission(false);
  Wire.requestFrom(MPU,14,true);  // request a total of 14 registers
  AcX=Wire.read()<<8|Wire.read();  // 0x3B (ACCEL_XOUT_H) & 0x3C
(ACCEL_XOUT_L)
  AcY=Wire.read()<<8|Wire.read();  // 0x3D (ACCEL_YOUT_H) & 0x3E
(ACCEL_YOUT_L)
 //AcZ=Wire.read()<<8|Wire.read();  // 0x3F (ACCEL_ZOUT_H) & 0x40
(ACCEL_ZOUT_L)
  GyX=Wire.read()<<8|Wire.read();  // 0x43 (GYRO_XOUT_H) & 0x44
(GYRO_XOUT_L)
  GyY=Wire.read()<<8|Wire.read();  // 0x45 (GYRO_YOUT_H) & 0x46
(GYRO_YOUT_L)
 //GyZ=Wire.read()<<8|Wire.read();  // 0x47 (GYRO_ZOUT_H) & 0x48
(GYRO_ZOUT_L)

  Serial.print("AcX = "); Serial.println(AcX);
  Serial.print(" | AcY = "); Serial.println(AcY);
 // Serial.print(" | AcZ = "); Serial.println(AcZ);
  Serial.print(" | GyX = "); Serial.print(GyX);
  Serial.print(" | GyY = "); Serial.print(GyY);
 // Serial.print(" | GyZ = "); Serial.println(GyZ);

 float a = AcX;
 float b = AcY;
 //float c = AcZ;


delay(100);

  if(b <= -7500)
  {
    digitalWrite(led1,HIGH);
    Serial.write('1');
```

```
 delay(50);
 }
 else if(b >= 7500)
 {
  digitalWrite(led4,HIGH);
  Serial.write('2');
  delay(50);
 }

 else if(a <= -7500)
 {
  digitalWrite(led2,HIGH);
  digitalWrite(led3,HIGH);
  Serial.write('3');
  delay(50);
 }
else if(a >= 7500)
 {

  digitalWrite(led1,HIGH);
  digitalWrite(led4,HIGH);
  Serial.write('4');
  delay(50);
 }
 else
 {
   digitalWrite(led2,LOW);
    digitalWrite(led1,LOW);
    digitalWrite(led3,LOW);
    digitalWrite(led4,LOW);
    delay(50);

}
}
```

CHAPTER-4

BENEFITS AND USES

4.1 Advantages / Benefits

- Optimum use of land.
- Minimizes land requirement & Maximize the vehicle parking capacity.
- Efficient & Profitability.
- Safety & Security
- Save time, money, fuel.
- Portable.
- Environment friendly.
- Modernization, valuable investment.
- We can increase parking capacity.

4.2 Unique Features of Project

- This invention relates to the field of robotics design. Segue which we are going to design will provide easiness to the any person. This system replaces current old age technology with modern era techniques such as giving command with hand movement, keeping advanced self-balancing detection sensors and many such privilege as per the patients' need i.e. if car is parked into 5no. Bucket and then retrieve time we only need to press 5 no. button & the 5no. Bucket will automatically come at ground position.

4.3 Usefulness with respect to existing solutions

Problem and weakness of current mechanism

- The previous mechanism have taken over one of the difficulty i.e. reduce the efforts which was needed previously for moving segue. Segue in used motor speed is very high that's way to generated the jerk. Jerk is effected to the balancing his the big problem of our project. For the joy stick input module person have to manage the movement of segue with the help of their hands is possible for that and easily segue is handle. And same goes for the accelerometer. So our project we have tried to concentrate on how to overcome those challenges.

Requirement of new mechanism

- Since those challenges can be overcome by selecting the worst case i.e. developing such segue which accepts input from the movement of human lag or hand and follow the command accordingly. This technique includes the controller. With this technique we can convert bio signal to electrical and follow further procedure. Proper Hardware and software interfacing is to be done.

4.4 Scope of Future work

- Since those challenges can be overcome by selecting the worst case i.e. developing such segue which accepts input from the movement of human eye and follow the command accordingly. This technique includes the image processing. With this technique we can convert bio signal to electrical and follow further procedure. Proper Hardware and software interfacing is to be done.
- Till now, segue were made that accepts the command in different ways but in our project input is given with the help of joystick (hand). As the movement of hand (joystick) will be done, command will be provided to segue and motion of segue is done. We will develop the original working model of segue in future academic year. But there are some features which we can add in our project. There can be advanced motor assembly which can sense the barrier and take the appropriate decision without taking help of the person using the system. And similarly such safety measures will be taken by detecting for any people. We can also make necessary changes in hardware and use segue on the garden area. In this manner we can make necessary changes and give whatever advancement as per the user requirement. Self-balancing accuracy is created properly and make a robust system for any people in day to day life in used.

Conclusion

- A people demand for small and very good computable devices of used in our life for moving to one place to other place. Segue is the one kind of the two wheel self-balancing devices for used as electrical vehicle. Here, Arduino used for the controlling purpose and motor used to provide movement to vehicle. Relay used to the motor switching purpose and balancing provide to gyroscope and acceleration provide to accelerometer. The main advantages are less space optimization, cost effectiveness, eco-friendly and secure.

References

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2. http://futureofmechnical.blogspot.com/
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4. http://saba.kntu.ac.ir/eecd/ecourses/instrumentation/projects/reports/Poly%20Gyroscope/Applications/Segway%20%20How%20it%20Works.htm
5. http://science.howstuffworks.com/transport/engines-equipment/ginger.htm
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7. http://learn.parallax.com/KickStart/27911
8. Segway Personal Transporter (PT)
9. Operating Characteristics Of The Segway Human Transporter
10. Instructable.com
11. Handbook of Arduino
12. Segway Design Project
13. Two wheel self-balancing robot

Appendix

1. Copy of Periodic Progress Report (PPR).
2. BMC Report
3. Patent Drafting Exercise

PRINT BACK

Enrollment No :	120030117009	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Patel Jaydeep Ramabhai	**Department :**	Instrumentation & Control Engineering
Mobile No :	8980843103	**Discipline :**	BE
Email :	jaydeep250395@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : -

Periodic Progess Report : First PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

In our first module we are getting initial jerk so we are planning to change the motor. Second thing we are planning to do to control the speed of motor as initial speed of motor is too large which can unbalance the module.

2. What challenge you have faced ?

As we want to change the motor we are finding which motor should we use and about controlling the speed of motor we are going to put circuit that can control the speed of motor but recently we don't have that type of circuit so we are planning to design it .

3. What support you need ?

Actually we have completed almost of work in our project and now only balancing part is remaining so we need support in that part as it is most difficult part of our project

4. Which literature you have referred ?

1. Arduino.cc 2. SEGWAY Personal Transporter (PT) 3. Operating Characteristics of the Segway Human Transporter 4. Patent study

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

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Student Name :	Patel Jaydeep Ramabhai	**Department :**	Instrumentation & Control Engineering
Mobile No :	8980843103	**Discipline :**	BE
Email :	jaydeep250395@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 0 days, 0 hours, 3 minutes, 9 seconds

Periodic Progess Report : Second PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have made rough sketch for our new model so we can hide our circuits and power supply battery so that rider have enough space to stand on SEGUE and have less difficulty to control the SEGUE. Simultaneously we are doing the programming from gyroscope for balancing.

2. What challenge you have faced ?

We have faced problems in the following sections. New design of the chassis and Balancing. When the motor starts running it gives large amount of jerk because of that unbalancing take place. Understanding the current capacity of Relays required for Wiper Motors.

3. What support you need ?

We are taking help from our guide for the system balancing purpose. We have also received guidance for programming of gyroscope to interface it with controller.

4. Which literature you have referred ?

1.Arduino.cc 2. Instructables.com 3. Handbook for Arduino SEGWAY Personal Transporter (PT) 4. Operating Characteristics of the Segway Human Transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

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Mobile No :	8980843103	**Discipline :**	BE
Email :	jaydeep250395@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 0 days, 0 hours, 1 minutes, 51 seconds

Periodic Progess Report : Third PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared business model canvas sheet. Have made the circuit for controlling speed of motor and started making the report.

2. What challenge you have faced ?

We are still faced problem in balancing we can decide the unbalance condition but after what to do on that we are finding solution.

3. What support you need ?

We need guidance for balancing purpose and for better accuracy in our mode.

4. Which literature you have referred ?

1.Arduino.cc 2.Instructables.com 3.handbook for Arduino SEGWAY Personal Transporter (PT) 4. Operating Characteristics of the Segway Human transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

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Student Name :	Patel Jaydeep Ramabhai	**Department :**	Instrumentation & Control Engineering
Mobile No :	8980843103	**Discipline :**	BE
Email :	jaydeep250395@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 7 days, 11 hours, 5 minutes, 20 seconds

Periodic Progess Report : Forth PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared Business model canvas Report and generate plagiarism certificate

2. What challenge you have faced ?

We are still faced problem in balancing we can decide the unbalance condition but after what to do on that we are finding solution

3. What support you need ?

We need guidance for Internet

4. Which literature you have referred ?

1.Arduino.cc 2.Instructables.com 3.handbook for Arduino SEGWAY Personal Transporter (PT) 4. Operating Characteristics of the Segway Human transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

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Enrollment No :	120030117018	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Patel Priyanshukumar Bharatkumar	**Department :**	Instrumentation & Control Engineering
Mobile No :	9712369243	**Discipline :**	BE
Email :	priyanshupatel.edu@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : -

Periodic Progess Report : First PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

In our first module we are getting initial jerk so we are planning to change the motor. Second thing we are planning to do to control the speed of motor as initial speed of motor is too large which can unbalance the module.

2. What challenge you have faced ?

As we want to change the motor we are finding which motor should we use and about controlling the speed of motor we are going to put circuit that can control the speed of motor but recently we don't have that type of circuit so we are planning to design it.

3. What support you need ?

Actually we have completed almost of work in our project and now only balancing part is remaining so we need support in that part as it is most difficult part of our project

4. Which literature you have referred ?

1. Arduino.cc 2. SEGWAY Personal Transporter (PT) 3. Operating Characteristics of the Segway Human Transporter 4. Patent study

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

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Enrollment No :	120030117018	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Patel Priyanshukumar Bharatkumar	**Department :**	Instrumentation & Control Engineering
Mobile No :	9712369243	**Discipline :**	BE
Email :	priyanshupatel.edu@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 0 days, 0 hours, 1 minutes, 20 seconds

Periodic Progess Report : Second PPR

Project : SEGUE

Status : Reviewed（Freeze）

1. What Progress you have made in the Project ?

We have made rough sketch for our new model so we can hide our circuits and power supply battery so that rider have enough space to stand on SEGUE and have less difficulty to control the SEGUE. Simultaneously we are doing the programming from gyroscope for balancing.

2. What challenge you have faced ?

We have faced problems in the following sections. New design of the chassis and Balancing. When the motor starts running it gives large amount of jerk because of that unbalancing take place. Understanding the current capacity of Relays required for Wiper Motors

3. What support you need ?

We are taking help from our guide for the system balancing purpose. We have also received guidance for programming of gyroscope to interface it with controller.

4. Which literature you have referred ?

Arduino.cc Instructables.com Handbook for Arduino SEGWAY Personal Transporter (PT) Operating Characteristics of the Segway Human Transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

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Enrollment No :	120030117018	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Patel Priyanshukumar Bharatkumar	**Department :**	Instrumentation & Control Engineering
Mobile No :	9712369243	**Discipline :**	BE
Email :	priyanshupatel.edu@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 0 days, 0 hours, 1 minutes, 17 seconds

Periodic Progess Report : Third PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared business model canvas sheet. Have made the circuit for control

PRINT BACK

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Student Name :	Patel Priyanshukumar Bharatkumar	**Department :**	Instrumentation & Control Engineering
Mobile No :	9712369243	**Discipline :**	BE
Email :	priyanshupatel.edu@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 7 days, 11 hours, 5 minutes, 4 seconds

Periodic Progess Report : Forth PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared Business model canvas Report and generate plagiarism certificate

2. What challenge you have faced ?

We are still faced problem in balancing we can decide the unbalance condition but after what to do on that we are finding solution

3. What support you need ?

We need guidance for Internet

4. Which literature you have referred ?

1.Arduino.cc 2.Instructables.com 3.handbook for Arduino SEGWAY Personal Transporter (PT) 4. Operating Characteristics of the Segway Human transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

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Enrollment No :	120030117022	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Vyas Bhrugu Vipulkumar	**Department :**	Instrumentation & Control Engineering
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Email :	bhrugu21@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : -

Periodic Progess Report : First PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

In our first module we are getting initial jerk so we are planning to change the motor. Second thing we are planning to do to control the speed of motor as initial speed of motor is too large which can unbalance the module.

2. What challenge you have faced ?

As we want to change the motor we are finding which motor should we use and about controlling the speed of motor we are going to put circuit that can control the speed of motor but recently we don't have that type of circuit so we are planning to design it .

3. What support you need ?

Actually we have completed almost of work in our project and now only balancing part is remaining so we need support in that part as it is most difficult part of our project.

4. Which literature you have referred ?

1. Arduino.cc 2. SEGWAY Personal Transporter (PT) 3. Operating Characteristics of the Segway Human Transporter 4. Patent study

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

PRINT BACK

Enrollment No :	120030117022	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Vyas Bhrugu Vipulkumar	**Department :**	Instrumentation & Control Engineering
Mobile No :	8866111387	**Discipline :**	BE
Email :	bhrugu21@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 0 days, 15 hours, 56 minutes, 47 seconds

Periodic Progess Report : Second PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have made rough sketch for our new model so we can hide our circuits and power supply battery so that rider have enough space to stand on SEGUE and have less difficulty to control the SEGUE. Simultaneously we are doing the programming fro gyroscope for balancing.

2. What challenge you have faced ?

We have faced problems in the following sections. New design of the chassis and Balancing. When the motor starts running it gives large amount of jerk because of that unbalancing take place. Understanding the current capacity of Relays required for Wiper Motors.

3. What support you need ?

We are taking help from our guide for the system balancing purpose. We have also received guidance for programming of gyroscope to interface it with controller.

4. Which literature you have referred ?

Arduino.cc Instructables.com Handbook for Arduino SEGWAY Personal Transporter (PT) Operating Characteristics of the Segway Human Transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

PRINT BACK

Enrollment No :	120030117022	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Vyas Bhrugu Vipulkumar	**Department :**	Instrumentation & Control Engineering
Mobile No :	8866111387	**Discipline :**	BE
Email :	bhrugu21@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 20 days, 15 hours, 7 minutes, 22 seconds

Periodic Progess Report : Third PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared business model canvas sheet. Have made the circuit for controlling speed of motor and started making the report.

2. What challenge you have faced ?

We are still faced problem in balancing we can decide the unbalance condition but after what to do on that we are finding solution.

3. What support you need ?

We need guidance for balancing purpose and for better accuracy in our model.

4. Which literature you have referred ?

Arduino.cc , Instructables.com, handbook for Arduino SEGWAY Personal Transporter (PT) Operating Characteristics of the Segway Human transporter .

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

PRINT BACK

Enrollment No :	120030117022	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Vyas Bhrugu Vipulkumar	**Department :**	Instrumentation & Control Engineering
Mobile No :	8866111387	**Discipline :**	BE
Email :	bhrugu21@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 7 days, 11 hours, 36 minutes, 47 seconds

Periodic Progess Report : Forth PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared Business model canvas Report and generate plagiarism certificate

2. What challenge you have faced ?

We are still faced problem in balancing we can decide the unbalance condition but after what to do on that we are finding solution

3. What support you need ?

We need guidance for Internet

4. Which literature you have referred ?

1.Arduino.cc 2.Instructables.com 3.handbook for Arduino SEGWAY Personal Transporter (PT) 4. Operating Characteristics of the Segway Human transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

PRINT BACK

Enrollment No :	120030117005	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Ruparelia Stavan Yogeshbhai	**Department :**	Instrumentation & Control Engineering
Mobile No :	9687435001	**Discipline :**	BE
Email :	stavanrupareliya7878@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : -

Periodic Progess Report : First PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

In our first module we are getting initial jerk so we are planning to change the motor. Second thing we are planning to do to control the speed of motor as initial speed of motor is too large which can unbalance the module.

2. What challenge you have faced ?

As we want to change the motor we are finding which motor should we use and about controlling the speed of motor we are going to put circuit that can control the speed of motor but recently we don't have that type of circuit so we are planning to design it.

3. What support you need ?

Actually we have completed almost of work in our project and now only balancing part is remaining so we need support in that part as it is most difficult part of our project

4. Which literature you have referred ?

1. Arduino.cc 2. SEGWAY Personal Transporter (PT) 3. Operating Characteristics of the Segway Human Transporter 4. Patent study

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

PRINT BACK

Enrollment No :	120030117005	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Ruparelia Stavan Yogeshbhai	**Department :**	Instrumentation & Control Engineering
Mobile No :	9687435001	**Discipline :**	BE
Email :	stavanruparelia7878@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 0 days, 0 hours, 2 minutes, 57 seconds

Periodic Progess Report : Second PPR

Project : SEGUE

Status : Reviewed（Freeze）

1. What Progress you have made in the Project ?

We have made rough sketch for our new model so we can hide our circuits and power supply battery so that rider have enough space to stand on SEGUE and have less difficulty to control the SEGUE. Simultaneously we are doing the programming from gyroscope for balancing.

2. What challenge you have faced ?

We have faced problems in the following sections. New design of the chassis and Balancing. When the motor starts running it gives large amount of jerk because of that unbalancing take place. Understanding the current capacity of Relays required for Wiper Motors.

3. What support you need ?

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Comments

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Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

PRINT BACK

Enrollment No :	120030117005	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Ruparelia Stavan Yogeshbhai	**Department :**	Instrumentation & Control Engineering
Mobile No :	9687435001	**Discipline :**	BE
Email :	stavanrupareliya7878@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 0 days, 0 hours, 2 minutes, 3 seconds

Periodic Progess Report : Third PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared business model canvas sheet. Have made the circuit for controlling speed of motor and started making the report.

2. What challenge you have faced ?

We are still faced problem in balancing we can decide the unbalance condition but after what to do on that we are finding solution.

3. What support you need ?

We need guidance for balancing purpose and for better accuracy in our model.

4. Which literature you have referred ?

Arduino.cc , Instructables.com, handbook for Arduino SEGWAY Personal Transporter (PT) Operating Characteristics of the Segway Human transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

PRINT BACK

Enrollment No :	120030117005	**College :**	Atmiya Institute Of Technology & Science, Rajkot
Student Name :	Ruparelia Stavan Yogeshbhai	**Department :**	Instrumentation & Control Engineering
Mobile No :	9687435001	**Discipline :**	BE
Email :	stavanrupareliya7878@gmail.com	**Semester :**	Semester 8

PPR Details

Time Interval : 6 days, 15 hours, 16 minutes, 58 seconds

Periodic Progess Report : Forth PPR

Project : SEGUE

Status : Reviewed (Freeze)

1. What Progress you have made in the Project ?

We have prepared Business model canvas Report and generate plagiarism certificate.

2. What challenge you have faced ?

We are still faced problem in balancing we can decide the unbalance condition but after what to do on that we are finding solution.

3. What support you need ?

We need guidance for Internet.

4. Which literature you have referred ?

1.Arduino.cc 2.Instructables.com 3.handbook for Arduino SEGWAY Personal Transporter (PT) 4. Operating Characteristics of the Segway Human transporter

Comments

Comment by Internal Guide :

None

Comment by External Guide :

None

Comment by HOD :

None

Comment by Principal :

None

Comment by University Admin :

None

CHAPTER-1

What is business model canvas?

The Business Model Canvas (BMC) gives us the structure of a business plan without the overhead and the improvisation of a 'back of the napkin sketch without the fuzziness (and coffee rings).

The Canvas is popular with entrepreneurs and entrepreneurs for business model innovation. Fundamentally, I find it delivers three things:

Focus: Stripping away the 40+ pages of 'stuff' in a traditional business plan, I've seen users of the BMC improve their clarify and focus on what's driving the business (and what's non-core and getting in the way).

Flexibility: It's a lot easier to tweak the model and try things (from a planning perspective) with something that's sitting on a single page.

Transparency: Your team will have a much easier time understanding your business model and be much more likely to buy in to your vision when it's laid out on a single page.

CHAPTER-2

What are the elements of the BMC?

KEY PARTNERS

It is always recommended to map Key Partners to Key Activities. If an activity is key, it's still part of your business model. This is a way to denote which specific Partners are handling various Key Activities for you. This business block is intended to answer the following questions:

Who are our Key Partners?

Who are our key suppliers?

Which Key Resources are we acquiring from partners?

Which Key Activities do partners perform?

There are few partners in this project such as:

- Student
- Engineer
- Child
- Actor

KEY ACTIVITIES

The Key Activities block aims at answering the following set of questions in your business model:

What Key Activities do our Value Propositions require?

Our Distribution Channels?

Customer Relationships?

Revenue streams?

Categories:-

- Self-Balancing
- Harding

KEY RESOURCES

This segment of the business model canvas answers the following questions.

What Key Resources do our Value Propositions require?

Our Distribution Channels? Customer Relationships?

Revenue Streams?

Types of resources:-

- Battery
- Firm Mechanical Structure
- Sun Light

VALUE PROPOSITIONS

The Value Propositions business block aims at providing answers to the following questions:

What value do we deliver to the customer?

Which one of our customer's problems are we helping to solve?

What bundles of products and services are we offering to each Customer Segment?

Which customer needs are we satisfying?

Examples:-

- Strong Mechanical Structure
- No Fuel Require
- Energy Saving

CUSTOMER RELATIONSHIPS

The customer relationship business block answers the following questions:

What type of relationship does each of our Customer Segments expect us to establish and maintain with them?

Which ones have we established?

How are they integrated with the rest of our business model?

How costly are they?

Examples:-

- Customer Satisfactions
- Services
- Offers

CHANNELS

This business block comprises of a list of important Channels, linked to Personas or Segments if they differ substantially. Make notes on what steps are relevant for each- promotion, sales, service, etc. This business block provides answers to the following questions:

Through which Channels do our Customer Segments want to be reached?

How are we reaching them now?

How are our Channels integrated?

Which ones work best?

Which ones are most cost-efficient?

How are we integrating them with customer routines?

Example:-

- Distributed
- Online Selling
- Salesman

CUSTOMER SEGMENTS

Customer Segment block is to present the list of Personas, organized by Customer Segment. If you have more than one segment. It is always recommended to prioritize them.

Who would you pitch first if you could only pitch one? Who next? And so forth…

For whom are we creating value?

Who are our most important customers?

Examples:-

- Students
- Scientists
- Businessman
- Industrial Worker

COST STRUCTURE

Cost Structure business block provides a list of Cost Structure elements with notes on their relationship to Key Activities.

This block in the business model answers the following questions:

What are the most important costs inherent in our business model?

Which Key Resources are most expensive?

Which Key Activities are most expensive?

Is your business more

Cost Driven (leanest cost structure, low price value proposition, maximum automation, extensive outsourcing)

Value Driven (focused on value creation, premium value proposition)

Example:-

- Arduino
- Battery
- Self-Balancing Mechanical

REVENUE STREAMS

Revenue Streams block of Business Model Canvas aims at answering the following questions:

For what value are our customers really willing to pay?

For what do they currently pay?

How are they currently paying?

How would they prefer to pay?

How much does each Revenue Stream contribute to overall revenues?

Types of Revenue Streams:

- Government Subsidies
- Agency
- Advertisements

GTU Innovation Council

Patent Drafting Exercise (PDE)

FORM 1 **THE PATENTS ACT 1970** **(39 OF 1970)** **&** **THE PATENTS RULES, 2003** **APPLICATION FOR GRANT OF PATENT**	**(FOR OFFICE USE ONLY)** **Application No:** **Filing Date:** **Amount of Fee paid:** **CBR No:**_____

1. Applicant(s) :

ID	Name	Nationality	Address	Mobile No.	Email
1	Patel Jaydeep Ramabhai	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	8980843103	jaydeep250395@gmail.com
2	Ruparelia Stavan Yogeshbhai	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	9687435001	stavanruparelia7878@gmail.com
3	Patel Priyanshukumar Bharatkumar	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	9712369243	priyanshupatel.edu@gmail.com
4	Vyas Bhrugu Vipulkumar	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	8866111387	bhrugu21@gmail.com
5	Jimit A. Talati	Indian	Atmiya Institute Of Technology & Science, "Yogidham Gurukul", Kalawad Road, Rajkot- 360005	8128990298	jatalati@aits.edu.in

2. Inventor(s):

ID	Name	Nationality	Address	Mobile No.	Email
1	Patel Jaydeep Ramabhai	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	8980843103	jaydeep250395@gmail.com

2	Ruparelia Stavan Yogeshbhai	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	9687435001	stavanrupareliya7878@gmail.com
3	Patel Priyanshukumar Bharatkumar	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	9712369243	priyanshupatel.edu@gmail.com
4	Vyas Bhrugu Vipulkumar	Indian	Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.	8866111387	bhrugu21@gmail.com
5	Jimit A. Talati	Indian	Atmiya Institute Of Technology & Science, "Yogidham Gurukul", Kalawad Road, Rajkot- 360005	8128990298	jatalati@aits.edu.in

3. Title of Invention/Project:

SEGUE

4. Address for correspondence of applicant/authorized patent agent in india

Name: Patel Jaydeep Ramabhai

Address: Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technological University.

Mobile: 8980843103

Email ID: jaydeep250395@gmail.com

5. Priority particulars of the application(S) field in convention country

Country	Application No.	Filing Date	Name of the Applicant	Title of the Invention
N/A	***N/A***	***N/A***	***N/A***	***N/A***

6. Particulars for filing patent co-operation treaty (pct) national phase Application

International application number	International filing date as alloted by the receiving office
N/A	**N/A**

7. Particulars for filing divisional application

Original(First) Application Number	Date of filing of Original (first) application
N/A	**N/A**

8. Particulars for filing patent of addition

Original(First) Application Number	Date of filing of Original (first) application
N/A	**N/A**

9. DECLARATIONS:

(i) Declaration by the inventor(s)

I/We, the above named inventor(s) is/are true & first inventor(s) for this invention and declare that the applicant(s). herein is/are my/our assignee or legal representative.

Date : 27 - April - 2016

	Name	Signature & Date
1	Patel Jaydeep Ramabhai	_____
2	Ruparelia Stavan Yogeshbhai	_____
3	Patel Priyanshukumar Bharatkumar	_____
4	Vyas Bhrugu Vipulkumar	_____
5	Jimit A. Talati	_____

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant (s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.applicant(s)

(iii) Declaration by the applicant(s)

I/We, the applicant(s) hereby declare(s) that:-

- ☑ I am/We in possession of the above mentioned invention.
- ☑ The provisional/complete specification relating to the invention is filed with this aplication.
- ☑ The invention as disclosed in the spcification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- ☑ There is no lawful ground of objection to the grant of the patent to me/us.
- ☑ I am/we are the assignee or the legal representative of true & first inventors.
- ☑ The application or each of the application,particulars of each are given in the para 5 was the first applicatin in the convention country/countries in respect of my/our invention.
- ☑ I/we claim the priority from the above mentioned applications(s) filed in the convention country/countries & state that no application for protection in respect of invention had been made in a convention country before that date by me/us or by any person
- ☑ My/Our application in india is based on international application under Patent Cooperation Treaty (PCT) as mentioned in para 6
- ☑ The application is divided out of my/our application(s) particulars of which are given in para 7 and pray that this application may be treated as deemed to have been filed on _____under section 16 of the Act.
- ☑ The said invention is an improvement in or modification of the invention particulars of ehivh are given in para 8.

10. Following are the attachments with the application:

- ☑ (a) Provisional specification/Complete specification
- ☑ (b) Complete specification(In confirmation with the international application) / as amended before the international Preliminary Examination Authority (IPEA),as applicable(2 copies),No.of pages.....No.of claims.....

- [x] (c) Drawings (In confirmation with the international application)/as amended before the international Preliminary Examination Authority(IPEA),as applicable(2 copies),No.of sheets....
- [x] (d) Priority documents
- [x] (e) Translations of priority documents/specification/international search reports
- [x] (f) Statement and undertaking on Form 3
- [x] (g) Power of Authority
- [x] (h) Declaration of inventorship on Form 5
- [x] (i) Sequence listing in electronic Form
- [x] (j) ..... Fees Rs.XXX in Cash /Cheque/Bank Draft bearin No.XXX Date: XXX on XXX Bank.

I/We hereby declare that to the best of my /our knowledge, information and belief the fact and mtters stated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this **27** day of **April** , **2016**

	Name	Signature & Date
1	Patel Jaydeep Ramabhai	_____
2	Ruparelia Stavan Yogeshbhai	_____
3	Patel Priyanshukumar Bharatkumar	_____
4	Vyas Bhrugu Vipulkumar	_____
5	Jimit A. Talati	_____

FORM 2
THE PATENTS ACT, 1970
(39 OF 1970)
&
THE PATENTS RULES, 2003
PROVISIONAL SPECIFICATION

1. Title of the project/invention :

SEGUE

2. Applicant(s) :

Patel Jaydeep Ramabhai (Indian)
Address : Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Ruparelia Stavan Yogeshbhai (Indian)
Address : Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Patel Priyanshukumar Bharatkumar (Indian)
Address : Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Vyas Bhrugu Vipulkumar (Indian)
Address : Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Jimit A. Talati (Indian)
Address : Atmiya Institute Of Technology & Science,
"Yogidham Gurukul", Kalawad Road,
Rajkot- 360005

3. Preamble to the description :

The following specification describes the invention.

4. Description :

a. Field of Application / Project / Invention :

Segway is the Hi-Tech scooter which is used to move from one place to another place. It is like a scooter so it consisting of two wheel but both the wheels are parallel to each other that are placed side by side. To move forward or backward on the Segway, the rider used to lean slightly forward or backward using handlebar and to turn left or right the rider turns the handlebar in right or left side. The balancing act is most amazing and interesting thing about the Segway, and it is the key operation to ride it.

b. Prior Art / Background of the Invention / References :

Now a days we can see rich people have main problem of mobility. So we came with an idea of Smart segue which can help them to remove this deficiency. We have visited Mall, Garden, Playground and talk with people and took different suggestion. Also we talk with people who are facing disability. And then we have started to search the solution of this actual problem. For this we have taken help from college and project guide. Then we have started to find the patents related to this innovation.

c. Summary of the Invention/Project :

The numbers of persons who are golf player dependent on others servant or a big car that's way only used a new technology and easily go with any place of garden and paly game. Rich people doesn't like to walking long distance so the used segue for our walking. Parking spaceis no more so the people phase problem of parking that time segue is used. The current mechanism includes many new changes as compare to classical approach. In classical approach person need to give more efforts for having mobility and which is much tiresome and sometimes need person for their help. But now a days this things are replaced by new techniques. With the help of hardware and software those efforts were diminished by providing different inputs or command which can easily move segue. Those different inputs are joy stick, touchpad, accelerometer etc.

d. Objects of the Invention/Project :

Segue is very expensive now a days. That's why common people can't use it. In a country like India where rich people are less in number compared to middle class and low class people, it is not preferable. If it available for low cost it will be preferred by all. That is the ultimate aim of our project. The makes Segue with a cost around of Rs 30,000/-. We named it as segue or human transporter or homemade segue. Our country people phase the "walking problem". In addition, they also appeared set on solving the "bicycling problem." The Segue can best be compared to the unicycle. It even looks a bit like one. In Segue used the gyroscope and accelerometer for the solved many problem of self-balancing. Segue is easily handle and low parking space is required. Its product in the less pollution. Our design work in the solar energy. Solar energy is renewable and easily getting in the morning. This energy is free of cost is used and this benefit is plus point of segue cost. Segue in less pollution because this design in not used any fuel. Our project is eco-friendly and all people is easily used.

e. Drawing(s) :

f. Description of the Invention :

The basic principle behind the working operation is comes from in our body operation. If we stand up and lean forward, we will out of balance, and we probably will fall on upon ours face. But our brain knows that we are out of balance, because of fluid in your inner ear shifts, so it triggers us to put ours leg forward and stop the fall. If we keep leaning forward, our brain will keep putting our legs forward to keep us upright. Instead of falling, we will walk forward, one step at a time. The Segway also does same things. Instead of legs it has wheels, a motor instead of muscles, a collection of microprocessors and microcontrollers instead of a brain and a set of sophisticated tilt sensors instead of an inner-ear for balancing system. Like our brain, the Segway knows when we are leaning forward. To maintain balance, it turns the wheels at just the right speed, so we move forward.

g. Examples :

h. Unique Features of the Project :

This invention relates to the field of robotics design. Segue which we are going to design will provide easiness to the any person. This system replaces current old age technology with modern era techniques such as giving command with hand movement, keeping advanced self-balancing detection sensors and many such privilege as per the patients need.

5. Date & Signature :

Date :27 - April - 2016

Sign and Date
Patel Jaydeep Ramabhai

Sign and Date
Ruparelia Stavan Yogeshbhai

Sign and Date
Patel Priyanshukumar Bharatkumar

Sign and Date
Vyas Bhrugu Vipulkumar

Sign and Date
Jimit A. Talati

6. Abstract of the project / invention :

The world is growing fast in technologies without considering the effects to the nature. People started using hi-tech technologies in their day to day life and becoming crazy behind the systems which make their life easy. It is always difficult to exactly understand the needs and live accordingly. In today's world many systems are installed in the vehicles for our use. Now-a-days vehicles are becoming the primary need for any person. But as this usage of vehicles increases, it may also increase the pollution in the environment. As per the statistics we have observed through various online resources we have produced the same amount of CO_2 after 1970 as we have produced in 6500 years before 1970. Different types of fuels are being used in vehicles which is a non-renewable source. It is highly demanding as far as the existence of earth is concerned, we should divert our focus towards the renewable energy sources and vehicles which are compact in size and uses almost no fuel.

Drawing Attachments :

FORM 3
THE PATENTS ACT, 1970
(39 OF 1970)
&
THE PATENTS RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8

1. Declaration :

I/We, Patel Jaydeep Ramabhai ,
Ruparelia Stavan Yogeshbhai ,
Patel Priyanshukumar Bharatkumar ,
Vyas Bhrugu Vipulkumar ,
Jimit A. Talati

2. Name, Address and Nationality of the joint Applicant :

Patel Jaydeep Ramabhai (Indian)
Address :Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Ruparelia Stavan Yogeshbhai (Indian)
Address :Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Patel Priyanshukumar Bharatkumar (Indian)
Address :Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Vyas Bhrugu Vipulkumar (Indian)
Address :Instrumentation & Control Engineering , Atmiya Institute Of Technology & Science, Rajkot , Gujarat Technologycal University.

Jimit A. Talati (Indian)
Address :Atmiya Institute Of Technology & Science,
"Yogidham Gurukul", Kalawad Road,
Rajkot- 360005

Here by declare :

(i) that I/We have not made any application for the same/substantially the same invention outside India.

(ii) that the right in the application(s) has/have been assigned to,

Name of the Country	*Date of Application*	*Application Number*	*Status of the Application*	*Date of Publication*	*Date of Grant*
N/A	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

(iii) that I/We undertake that up to the date of grant of patent by the Controller , I/We would keep him inform in writing the details regarding corresponding application(s) for patents filed outside India within 3 months from the date of filing of such application.

Dated this **27** day of **April** , **2016**

3. Signature of Applicants :

Sign and Date
Patel Jaydeep Ramabhai

Sign and Date
Ruparelia Stavan Yogeshbhai

Sign and Date
Patel Priyanshukumar Bharatkumar

Sign and Date
Vyas Bhrugu Vipulkumar

Sign and Date
Jimit A. Talati

To
The Controller of Patent
The Patent Office, at **Mumbai.**