E Bike Speed Controller System using STM 32

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Abstract: Electric bikes are eco-friendly, less expensive, and more efficient and are the solution to the transportation problem. Many electric bikes were implemented using a pseudo speed control principle that doesn't have, speed control that must be desirable for driver comfort and safety. This project describes a low-cost feedback speed controller for an instrumented electric bike. To achieve this, the throttle values are a feedback system based on sensing speed. As with automobiles monitored by the stm32 controller using a throttle sensor. The throttle sensor works on the principle of the Hall Effect. The speed sensor monitors the wheel rpm value, and it is to be displayed on the LCD by the stm32 controller. The controller processes the throttle signal before operating the motor via the motor driver to control it is power and speed. The motor voltage is altered in response to throttle speed. The system makes use of a stm32 controller along with throttle input, speed sensor for tire speed, switch, motor driver, e-bike motor, battery, and led display to develop the system. The motor speed and sensor monitoring are turned off when the main switch is turned off. The complete process restarts as soon as the switch is turned on.

Keywords- STM 32, LED, LCD, RPM, ETC, TPS

I.INTRODUCTION

Programmable object interface or IOT refers to the collection of different types of daily life appliances and gadgets used in different sectors that are broadening the aspect of the internet. The connectivity with the internet enables these devices to share and receive data with different objects. The [1][2]Internet of things simply means the network of devices that can share and receive data and information with other devices via using the internet. The things or objects in the Internet of Things above are well equipped with sensors, software, and machine learning techniques. The use of such objects reduces human interference in doing any of the work. The advent of IOT has changed the life of human beings by reducing their workload and time. The advancing technology day by day is giving rise to different smart objects thereby improving the standard of living of human beings. The development of a range of technologies has enhanced the lifestyle of human beings. Digitalization is taking place in India and the world at a very fast pace. Thus, to be in pace with the digital world, the network of smart devices is very essential. It is a technology that helps in establishing a good interaction between the different devices among themselves and also with human beings. Moreover, the emergence of devices embedded with sensors and advanced technologies reduces the workload of human beings. It helps in finishing different tasks in less time along with developing coordination with the activities taking place in the surroundings. The development of the network of these smart devices is not only useful in household work but also aids in commercial sector tasks. Thus, IOT in the 21st century has become an essential requirement in different sectors all around the world. The Internet of Things is a concept that has completely changed the way the world works by allowing a greater level of connection between inanimate objects. Things like home appliances, thermostats, and even vehicles can be included in this network and the ramifications of this change are far-reaching.

A. PROGRAMMABLE OBJECT INTERFACE

Programmable object interface or Internet of Things (IoT) is the networking of physical objects that contain electronics embedded within their architecture in order to communicate and sense interactions amongst each other or with respect to the external environment. In the upcoming years, IoT-based technology will offer advanced levels of services and practically change the way people lead their daily lives. Advancements in medicine, power, gene therapies, agriculture, smart cities, and smart homes are just a very few of the categorical examples where IoT is strongly established.

IoT is network of interconnected computing devices which are embedded in everyday objects, enabling them to send and receive data. Over 9 billion 'Things' (physical objects) are currently connected to the Internet, as of now. In the near future, this number is expected to rise to a whopping 20 billion.

Main components used in Programmable object interface:

[3]Low-power embedded systems: Less battery consumption and high performance are the inverse factors that play a significant role during the design of electronic systems.

[4]Sensors: Sensors are a major part of any IoT applications. It is a physical device that measures and detect a certain physical quantity and convert it into a signal which can be provided as input to a processing or control unit for analysis purpose

There are two ways of building IOT**:**

Form a separate internetwork including only physical objects.

Make the Internet ever more expansive, but this requires hard-core technologies such as rigorous cloud computing and rapid big data storage (expensive).

B. [5]SMART DOMOTICS

Smart Demotics or smart home systems can be something that makes our life quite easy. Starting from energy management where the power controls system in the AC appliances where we use the thermostat, all this is managed to cut down the power consumption that's taking place. A door management system, security management system, and water management system are part of this as well. Still, these are vital things that stand out in the smart home system. The limitation of IOT in smart home applications stops where our imagination stops. Anything that we wish to automate or want to make our life easier can be a part of a smart home, or a smartphone system as well.

Figure 1: Smart Domotics

Now, a smart home usually is going to be a base of a smart city. The smart city is an evolution of a smart home. Here, it is not just the sensors of a single home that is connected, here it's a correlation or a network or a connection between various organizations, various domains as well as multiple segments of that city as a whole. In the smart city, the life of every single dependent becomes more comfortable and in tune helps to develop that city to a greater extent as such. Now, the key factor for a smart city is government support as well, and if the governments are willing to take this step, then we hope we would see a smart city completely build on the Internet of Things. IOT home automation is the process of controlling home appliances automatically using various control system techniques. The electrical and electronic appliances in the home such as windows, refrigerators, fans, lights, fire alarms, kitchen timers, etc. can be controlled using various control techniques.

C. OUTLINE OF THE PROJECT

Classic smart home, internet of things, cloud computing, and rule-based event processing, are the building blocks of our proposed advanced smart home integrated compound. Each component contributes its core attributes and technologies to the proposed composition. IoT contributes to the internet connection and remote management of mobile appliances, incorporated with a variety of sensors. Sensors may be attached to home-related appliances, such as air-conditioning, lights, and other environmental devices. And so, it embeds computer intelligence into home devices to provide ways to measure home conditions and monitor home appliances' functionality. Cloud computing provides scalable computing power, storage space, and applications, for developing, maintaining, running home services, and accessing home devices anywhere at any time. The rule-based event processing system provides the control and orchestration of the entire advanced smart home composition.

D. AREA MONITORING

Area monitoring is a typical application of IOT. In area monitoring, the programmable object interface is deployed over a region where some phenomenon is to be monitored. As an example, a large quantity of sensor nodes could be deployed over a battlefield to detect enemy intrusion instead of using landmines. When the sensors detect the event being monitored heat, pressure, sound, light, or vibration the event needs to be reported to one of the base stations, which can take appropriate action (e.g., send a message or the related information on the internet or on a satellite).

II. EXISTING SYSTEM

Speed control means an intentional change of drive speed to a value required for performing the specific work process. This concept of speed control or adjustment should not be taken to include the natural change in speed which occurs due to changes in the load on the shaft.

Any given piece of industrial equipment may have its speed change Adjusted mechanically using stepped pulleys, sets of change gears, variable speed friction clutch mechanism, and other mechanical devices. Historically it is proved to be the first step in the transition from nonadjustable speed to adjustable speed drive. Electrical speed control has many economical as well as engineering advantages over mechanical speed control.

The nature of the speed control requirement for an industrial drive depends upon its type. Some drives may require a continuous variation of speed for the whole range from zero to full speed or over a portion of this range, while others may require two or more fixed speed.

III. PROPOSED METHOD

STM controller constantly monitors the throttle values. The throttle consists of a throttle position sensor (TPS). Non-contact type TPS work on the principle of Hall Effect or inductive sensors, or magneto resistive technologies, wherein by and large the magnet or inductive circle is the unique part that is mounted on the butterfly valve choke spindle shaft gear and the sensor and sign handling circuit board is mounted inside the ETC gearbox cover and is stationary. At the point when the magnet/inductive circle mounted on the spindle which is rotated from the lower

- Getting throttle input.

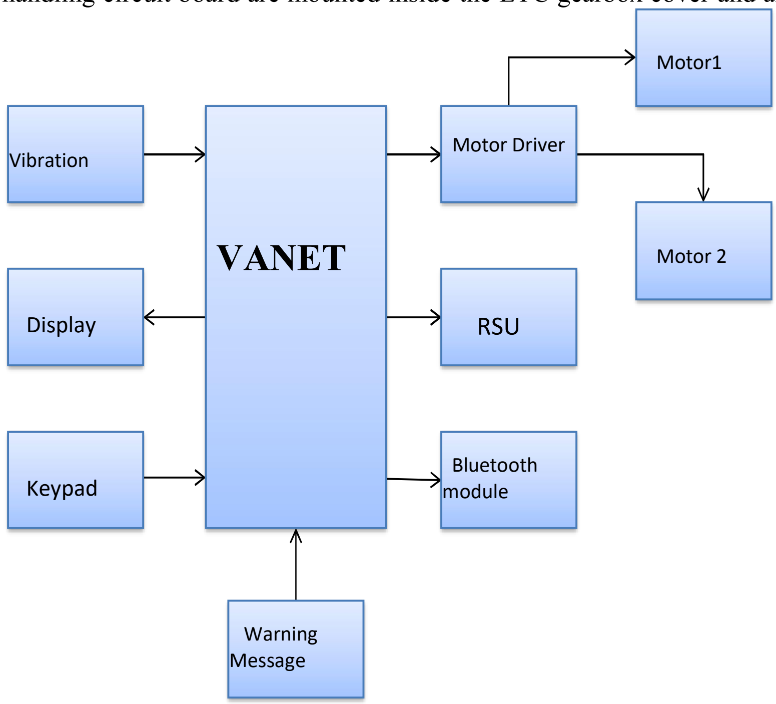
Controlling motor speed as per throttle.

- Getting Speed Values and displaying them on display
- Starting and shutting down bike as per start switch.

As we create this controller, we will primarily concentrate on the throttling and speed display components of e-bikes.

The throttle values are continuously monitored by the STM controller. A throttle position sensor is part of the throttle (TPS).

Non-contact type TPS operates on the tenets of magnet or resistive, Hall effect, or inductive sensors, where the sensor and sign handling circuit board are mounted inside the ETC gearbox cover and are stationary, and



the magnet or inductive circle is typically the unique component mounted on the butterfly valve choke spindle/shaft gear. Our proposed system works based on the broadcast system.

In this technique every vehicle is attached with a hard ware to alert the control unit about.some obstacle in certain road.

The Throttle signal is processed by the controller, and it then operates the motor through the motor driver. The motor voltage is varied as per throttle values to control its power and speed.

Then the control unit send the signal to the vehicles entering the city about the obstacle along theroad.

The receiving unit in the vehicle alert the driver about the issue and suggest alternate short path to their destination.

This project aims to maintain the perfect Speed control system in an E-bike. As with automobiles, speed control must be desirable for driver comfort and safety. To achieve this, the STM controller constantly monitors the throttle values using the throttle position sensor (TPS) and it then operates the motor through the motor driver. The motor voltage is varied as per throttle values to control its power and speed.

A.FLOW CHART

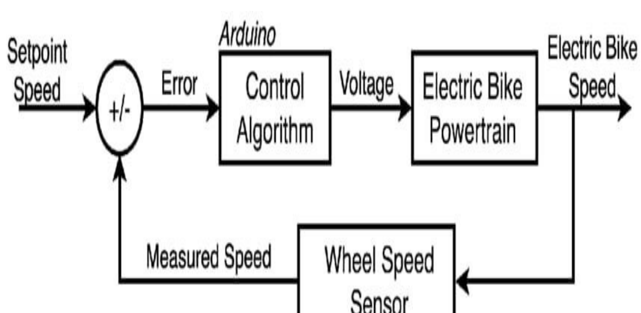


Figure 2: Flowchart

The functions of these relays are to act as an ON/OFF switch on the main control unit. Finally, with the help of Google Assistant, based on the user commands the home appliance can be turned ON/OFF with the help of the designed system. Here, we have shown the example of turning the three bulbs. However, any home appliance can be connected through the proposed control unit.

B.BLOCKDIAGRAM

Figure 3: Blockdiagram

Armature or Rheostat control method.
Flux control method. It is seen that speed of the motor is inversely proportional to flux.
Armature control method
Voltage Control Method

It is known that N α 1/ Φ by decreasing the flux, thus speed can be increased and vice versa. Hence, name the flux or field control method. The flux of the DC motor can be changed by changing Ish with help of a shunt field rheostat. Since Ish is relatively small, shunt field rheostat has to carry only a small so that rheostat is small in size. This method therefore very efficient in non-inter polar machines the speed can be increased by this method in the ratio 2:1 any further weakening of flux Φ adversely affects the communication And hence puts a limit to the maximum speed obtainable with this method in machines fitted with interlopes in the ratio of maximum to minimum speeds of 6:1 is fairly common. The connection diagram for this type of speed control.

C. *[7]ARDUINO UNOR3 MICROCONTROLLER*

The Arduino Uno R3 is a [8]microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as STM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board (A000046) has a resistor pulling the 8U2 HWB line to the ground, making it easier to put into DFU mode.

1.0 pinout: added SDA and SCL pins that are near the AREF pin and two other new pins placed near the RESET pin, the IOREF that allow the shields to adapt to the voltage provided by the board. In the future, shields will be compatible with both the board that uses the AVR, which operates with 5V, and with the Arduino Due which operates with 3.3V. The second one is a not connected pin that is reserved for future purposes.

IV .RESULTS

A.*SIMULATION OUTPUT*

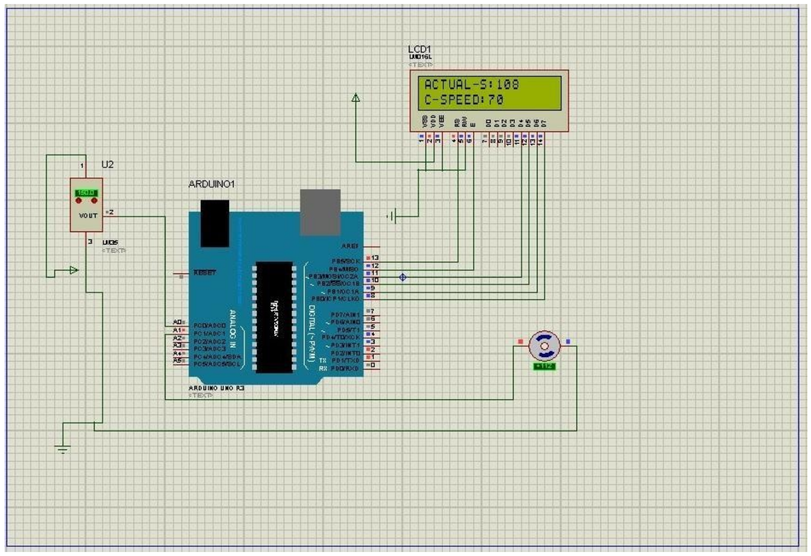


Figure 4: SIMULATION OUTPUT

The system detects the speed of the vehicle in which the controller act as the main source to restrict the vehicle's speed. This project deals with controlling the speed through the throttle. The input power will cut off when the vehicle reaches the speed limit. This leads to an efficient energy management system. In addition to it, the battery range will increase. The power drain system of the vehicle is also upgraded using the stm32.

B .*HARDWARE OUTPUT*

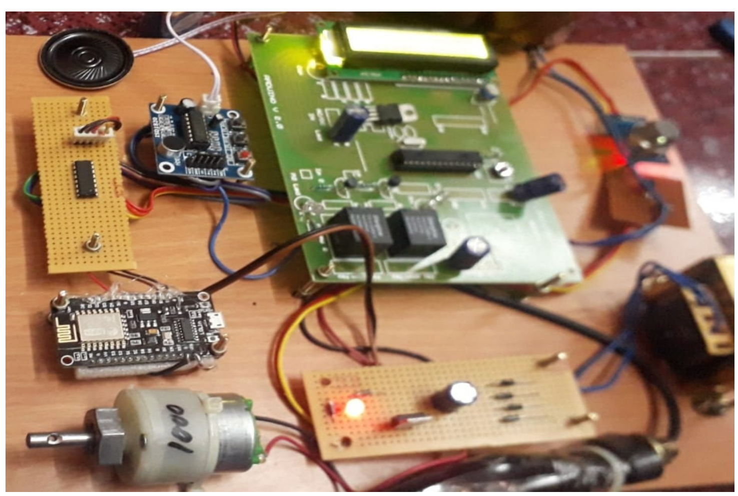


Figure 5: Hardware output

III. CONCLUSION AND FUTURE IDEAS

Thus, The Throttle signal is processed by the controller, and it then operates the motor through the motor driver. The motor voltage is varied as per throttle values to control its power and speed. Also, the controller constantly monitors speed sensor values. The speed sensor works on the Hall Effect principle to constantly transmit the wheel RPM. This RPM value is displayed on the LCD by the controller. The motor speed and sensor monitoring are turned off when the main switch is turned off. The complete process restarts as soon as the switch is turned on. Thus, we successfully develop and test our own E-bike controller using STM32. This project can be broken down into five separate categories: the lithium-ion battery, the DC-DC boost converter, the solar panel, the motor, and the motor controller. Each of these will be built upon and improved further by future students, one category at a time. The hope is that this design can become very efficient, cost-effective, and one day mass-produced, especially in developing countries where automotive transportation is impossible.

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