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# DUAL MODE AGV FOR SMALL SCALE INDUSTRIES

**S. Suresh Balaji*, R. Vignesh**, S. Sabarish**, S. Vijay** & G. S. Sanjaykrishna****

* Assistant Professor, Knowledge Institute of Technology, Salem, Tamilnadu
** UG Student, Knowledge Institute of Technology, Salem, Tamilnadu

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**Abstract:**

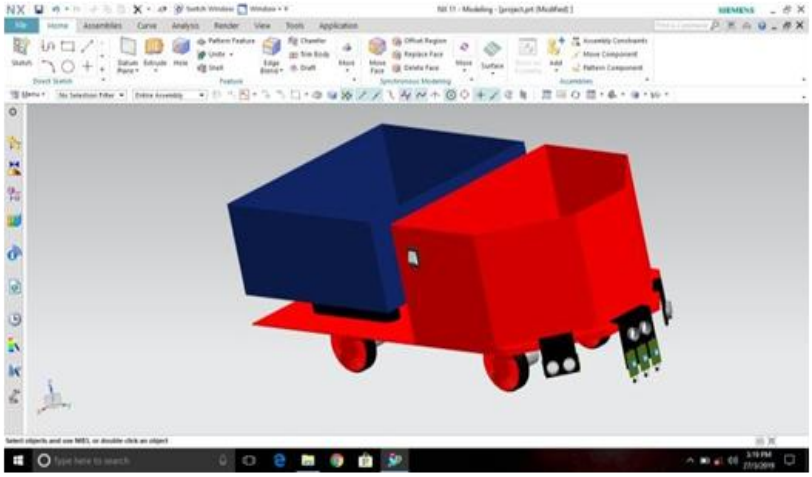
Robotics play a vital role in all research areas. The basic idea of our project is to increase productivity and efficiency of the industry. The other major aim of our project is to develop intelligent machines. AGV is one kind of intelligent transport machine that follows the given respective paths and route. Nowadays AGVs are used in almost all the countries. It has many advantages in our day to day life. Considering that AGVs are used to optimize our work in almost all the fields. In this project it has been developed a battery powered low cost AGV which can be operated in either automatic or manual mode on a flat surface with the help of four dc motors. It can be used in small scale industries to transport goods from one place to another. It is equipped with sensors to track the path and the environment so that it improves the safety and accuracy.

## 1. Introduction:

An AGV with both manual and automatic navigation control is designed at low cost so that it can be used in small scale industries like shopping malls, restaurants and theatres.

## 2. Modelling and Assembly of Dual Mode Agv:

NX CAD, formerly known as "Unigraphics" is an advanced high-end CAD/CAM/CAE, which has been owned by Siemens PLM Software since 2007. It is the most powerful, flexible, and innovative product development solution in the industry; It is used, among other tasks, for Design (parametric and direct solid / surface modelling) Engineering analysis (static; dynamic; electro-magnetic; thermal, using the finite element method; and fluid, using the finite volume method).Manufacturing finished design by using included machining modules. The application runs on Microsoft windows platform, and provides solid modelling, assembly modelling and drafting, direct and parametric modelling.



The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

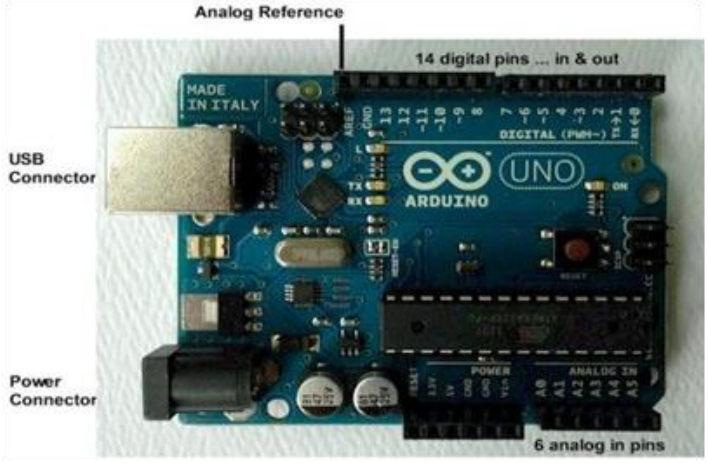



Figure 1: Arduino Microcontroller

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Automated guided vehicles (AGVs) are self-driven vehicles. Early types of AGVS were introduced around 1954. They are used to transport material from one location on the facility floor to another without any accompanying operator, and are widely used in material handling systems, flexible manufacturing systems, and container handling applications. With the advance of technology, more sophisticated machines are available, which considerably reduce machining and internal setup time. The aim of production planning includes along with fast production, efficient transportation of material between the workstations and in and out of storage. Flexible material handling systems are required to perform an efficient routing of material with random handling capability. The use of AGVs increases flexibility, since the flow path can easily be selected from number of alternative paths, or, can be reconfigured to accommodate new locations. The design of material handling guide path has a significant implication on the overall system performance and reliability, since it has a direct impact on the travel time, the installation cost, and the complexity of the control system software.

**3. Fabrication of Model:**

Aluminium is a unique material and also the third most abundant element in the world which is why it is ideal for numerous applications, from decorative home components to safety-critical components, and its uses continue to expand. Aluminium has lower density and higher thermal co-efficient. Aluminium is a very light material compared to others like steel, iron, copper or zinc14 when in contact with the atmosphere that prevents further corrosion. Hence aluminium sheets are opted for the construction of AGV.

**4. Working of Model:**

**Basic Working Principle**

The Block diagram below explains the working principle of the AGV

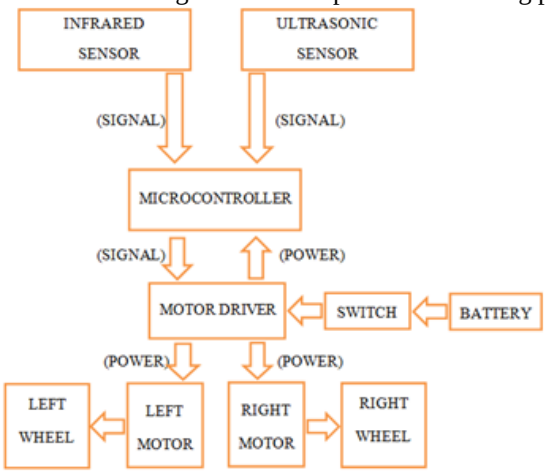


Figure 3: Working Principle

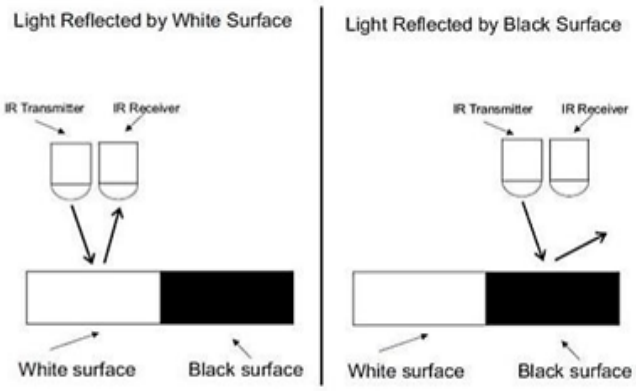


Figure 3: Working of IR Sensor

**Navigation:**

There are two navigation methods in this AGV, 1. Automatic & 2. Manual control

**Automatic:** AGVs (some known as automated guided carts or AGCs) use tape for the guide path. The tapes can be one of two styles: magnetic or colored. The AGV is fitted with the appropriate guide sensor to follow the path of the tape.

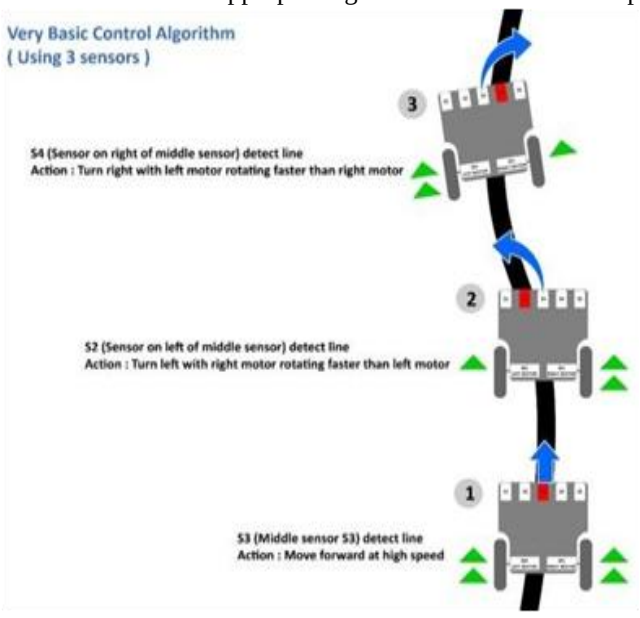


Figure 4: Steering Control

One major advantage of tape over wired guidance is that it can be easily removed and relocated if the course needs to change. Colored tape is initially less expensive, but lacks the advantage of being embedded in high traffic areas where the tape

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may become damaged or dirty. A flexible magnetic bar can also be embedded in the floor like wire but works under the same provision as magnetic tape and so remains unpowered or passive. Another advantage of magnetic guide tape is the dual polarity. small pieces of magnetic tape may be placed to change states of the AGC based on polarity and sequence of the tags.

**Working of Infrared Sensors**

IR Sensors consist of a photo-diode and an IR LED. When the IR sensor is powered the IR LED emits Infrared waves and when a black surface is detected the infrared waves will get absorbed by the surface and the IR sensor sends a low voltage signal to the microcontroller, when a white surface is detected the Infrared waves will get reflected back and will be absorbed by the photo-diode so that it will send a high voltage signal to the microcontroller. In our case the IR sensor is used to detect a black line and a white surface.

**Working of Ultrasonic Sensor**

Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. As the distance to an object is determined by measuring the time taken for the waves to travel and reflect back.

Distance = Speed X Time

Now using the above formula the distance is calculated and if the distance is less than 30 cm the AGV will be stopped.

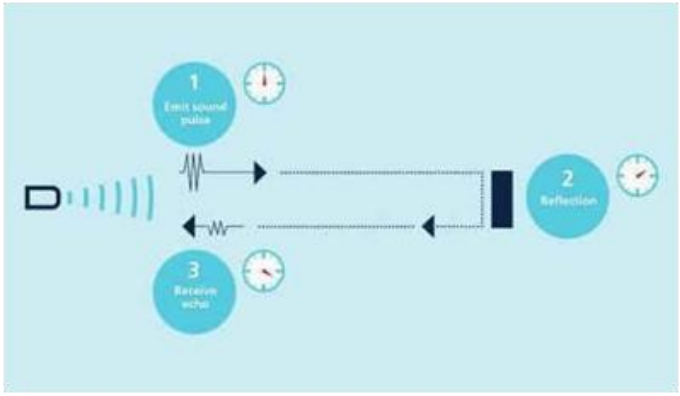


Figure 5: Working of Ultrasonic Sensor

**Manual Control:** Sometimes there may be a need for change in the path of the AGV in small scale industries so that a manual control is also present in this AGV. With which the worker can control the direction of motion of the AGV using his mobile phone. This AGV can be switched to the manual control using the DPDT switch. Once the manual control is enabled the labour can take over the control of the AGV by connecting his mobile phone to the bluetooth module.

**Working of Bluetooth Module:**

The HC-05 module Bluetooth module is connected to the Arduino and is turned ON. Then bluetooth is turned ON in the smartphone. Then under bluetooth settings in the smartphone HC-05 module is selected. The Android application named "CIRCUIT NINJA" is downloaded and installed in the smartphone. Then the Circuit ninja app is opened and the desired bluetooth device is selected. Now the worker can control the AGV navigation using the direction arrows in the app.

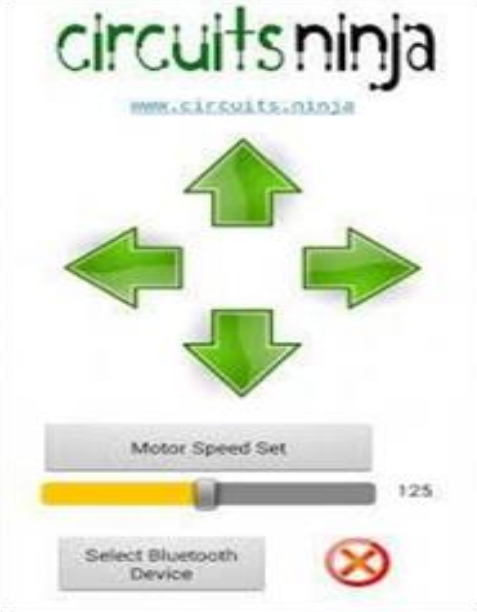


Figure 6: Circuit Ninja Application

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**5. Photography of the Fabricated Model:**

**6. Conclusion:**

Any machine must be inexpensive and easy to build if it is to be accepted by the society. This need is recognized and a "DUAL MODE AGV" is fabricated at low cost. This machine will only contain parts that are readily available and in use regularly. This eliminates the need to order or import components just for transporting goods. Automatic Guided Vehicle can be used in a wide variety of applications to transport many different types of material including pallets, rolls, racks, carts and containers. The important advantages of AGVs are reduce manpower, increase productivity, eliminate, reduce product damages, better control of material management, speed of delivery, flexibility of path, and reduction in labour cost. There are also some disadvantages of AGVs like, Installation cost is very high, AGVs are fragile and should be handled with care, regular inspection and maintenance needed, it should be recharged periodically and it will stop delivery when it is forced off the path. Despite of these disadvantages they are widely used in manufacturing and transporting facilities for the movement of material from one location to another.

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