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Design and Simulation of Automated Guided Vehicle

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ABSTRACT

Smart transportation is one of the important factor in the smart city environment because it enhance the citizen lives style and improving the sustainability. Driverless Automatically guided vehicles rely on environmental information for performing target-oriented movements and navigation. Handling multiple information from the environment is a complex task though, these information are necessary for improving the realization of these vehicles.

Therefore, considering the significance of sensor data in this guided vehicle environment, this article introduces Responder dependent Additive Information Fusion (RAIF) scheme.

This scheme observes the responding sensor information for determining the achievement level of the target endorsed for the guided vehicle. The multi-instance sensor information is gathered from the Internet of Things (IoT) based connected devise. The timely responding sensors and its data are correlated with the previous history for improving the precision of navigation of the guided vehicles.

This scheme relies on classification machine learning for identifying remitting and un-remitting instances based on correlation for information fusion. This helps to identify the error causing sensor information and to mitigate them from fusion to improve the precision of achieving the target.

KEYWORDS: *Guided Vehicles, Information Fusion, Internet of Things, Machine Learning, Smart City*

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1. INTRODUCTION

The manufacturing industry is the foundation of the national economy and the main battleground for scientific progress. Moreover, it is also the key area of supply-side structural reform. With the development of technological innovations and information technologies, the integration and development of manufacturing and artificial intelligence are becoming increasingly intensive. The manufacturing industry is turning to intelligence, information, and automation. Intelligent manufacturing is the main direction for the future development of manufacturing. The intelligent manufacturing environment is highly integrated with machine equipment, sensor equipment, and other hardware. Besides, it integrates calculation, control, data collection, operating system, and other software.

The new scientific revolution and industrial transformation are emerging. The global industrial technology system, development model, and competition pattern are undergoing significant changes. Developed countries have introduced advanced manufacturing as the core of the reindustrialization national strategy. Developing intelligent manufacturing is widely believed in theory and practice to represent the future direction of manufacturing. Intelligent manufacturing is a crucial area of development in the “A Country With Strong Transportation Network” initiative, which emphasizes the use of intelligent equipment to replace human labour and realize the unmanned production process. Therefore, manufacturing, logistics, e-commerce, and other enterprises have increasingly strong demands and higher requirements for intelligent and unmanned production and transportation processes. However, there are still some traditional workshops that mainly rely on manual trucks to transport materials. Efficiency is not high. To promote the development of intelligent manufacturing, the automated guided vehicle (AGV) is being adopted to replace the traditional manual truck.

The AGV, which first appeared in the 1950s, is a kind of automated unmanned intelligent transport equipment. It is a mobile robot system that can follow a predetermined path and is a key piece of equipment in modern industrial automation logistics systems such as the computer integrated manufacturing system. The AGV system (AGVS) is an automatic control system with multiple AGVs. The AGVs not only greatly improve the work efficiency and reliability of the system, but also realize the intelligence and automation of the system.

The AGVs are flexible and intelligent, and can be conveniently reorganized to achieve flexible transportation of the production process.

Compared with traditional manual orsemimanual material transportation, AGVs reduce labour intensity, reduce risks, and improve production efficiency. Thus, AGVs can have an important role in all walks of life. With the rapid development of advanced manufacturing technologies and the increasing degree of automation, modern manufacturing has entered a new stage that integrates personalization, automation, intelligence, and flexibility. As important transportation equipment in flexible manufacturing systems, AGVs have the characteristics of high adaptability, satisfactory safety, good flexibility, reliable work, and easy computer management. They are widely used in warehousing, automobile manufacturing, chemical, papermaking, electronics manufacturing, and other fields. AGVs have effectively improved the degree of automation and production efficiency of the system to meet the needs of enterprises.

1.1. PROBLEM STATEMENT

A. Humans make mistakes, by replacing the human element with AGV's you remove some of the potential for inaccurate workflows, ultimately reducing waste and increasing output, allowing your operations to become more productive and accurate.

B. AGVs are programmed with safety in mind, and as such are crammed with full of Cameras, Lasers and other sensors that allow them to safely operate around personnel and structures.

C. A simple miscount can throw off figures and create issues, but automated inventory systems can easily solve that issue. And it's another area where costs can be cut.

1.2. OBJECTIVES

A. To reduce human intervention in and around Production Lines and Warehouses.
B. Provide a safer and efficient Work Place environment.
C. Provide end to end solutions to transfer material or industrial goods for Packaging and Logistics.
D. To minimize running cost or Labour cost.

1.3. METHODOLOGY

Step 1: - We started the work of this project with literature survey. We gathered many research papers which are relevant to this topic. After going through these papers, we learnt about car towing machine.

Step 2: - After that the components which are required for my project are decided.

Step 3: - After deciding the components, the 3 D Model and drafting will be done with the help of CATIA software.

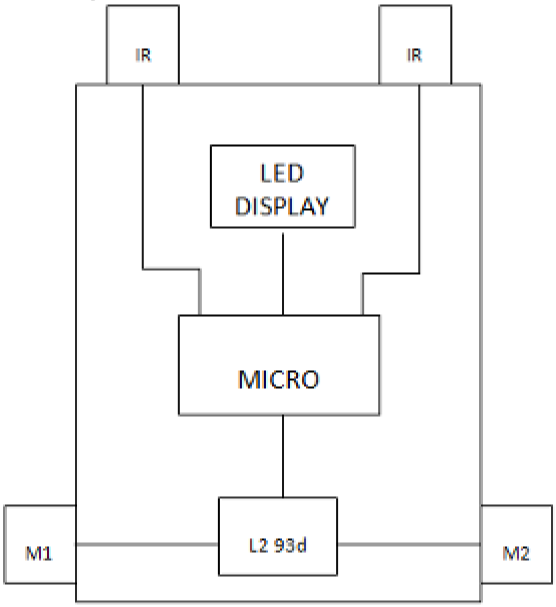
Step 4: - The components will be manufactured and then assembled together.

Step 5: - The testing will be carried out and then the result and conclusion will be drawn.

1.4. COMPONENTS REQUIRED

- Microcontroller
- IR Sensor
- ROBOT Chassis complete with screw
- DC Motors
- Wheels
- Bread Board
- Connecting wires
- Power supply or Power bank
- L293D Motor Driver
- LCD Display

2. Block Diagram



IR = IR SENSOR

MICRO = ATmega

328P Micro – controller

293D = Motor Driver IC

M - Motor

A. IR sensor:

IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which can be detected using a threshold.

A **passive infrared sensor** (**PIR sensor**) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. PIR sensors detect general movement, but do not give information on who or what moved. For that purpose, an active IR sensor is required.

PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". The term *passive* refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings. It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion**.**

Infrared technology is found not just in industry, but also in every-day life. Televisions, for example, use an infrared detector to interpret the signals sent from a remote control. Passive Infrared sensors are used for motion detection systems, and LDR sensors are used for outdoor lighting systems. The key benefits of infrared sensors include their low power requirements, their simple circuitry and their portable features.

Infrared Radiation Theory

Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation can be found between the visible and microwave regions. The infrared waves typically have wavelengths between 0.75 and 1000µm.

The infrared spectrum can be split into near IR, mid IR and far IR. The wavelength region from 0.75 to 3µm is known as the near infrared region. The region between 3 and 6µm is known as the mid-infrared region, and infrared radiation which has a wavelength greater higher than 6µm is known as far infrared.

The Foundations of Infrared Science

The theory of infrared spectroscopy had been around since F.W. Herschel discovered infrared light in 1800. Herschel conducted an experiment using a prism to refract light from the sun and was able to detect the presence of infrared radiation beyond the red part of the visible spectrum using a thermometer to measure an increase in temperature.

The Types of Infrared Sensors

Infrared sensors can be active or passive and they can be split into two main types:

- **Thermal infrared sensors** – use infrared energy as heat. Their photo sensitivity is independent of the wavelength being detected. Thermal detectors do not require cooling but do have slow response times and low detection capabilities. *Read more about Thermal Infrared Sensors here.*

- **Quantum infrared sensors** – provide higher detection performance and faster response speed. Their photo sensitivity is dependent on wavelength. Quantum detectors have to be cooled in order to obtain accurate measurements.

3. The Working Principle (Infrared Sensors)

The physics behind infrared sensors is governed by three laws:

1. **Planck's radiation law:** Every object at a temperature T not equal to 0 K emits radiation.
2. **Stephan Boltzmann Law:** The total energy emitted at all wavelengths by a black body is related to the absolute temperature
3. **Wein's Displacement Law:** Objects of different temperature emit spectra that peak at different wavelengths

All objects which have a temperature greater than absolute zero (0 Kelvin) possess thermal energy and are sources of infrared radiation as a result.

Sources of infrared radiation include blackbody radiators, tungsten lamps and silicon carbide. Infrared sensors typically use infrared lasers and LEDs with specific infrared wavelengths as sources.

A transmission medium is required for infrared transmission, which can be comprised of either a vacuum, the atmosphere or an optical fiber.

Optical components such as optical lenses made from quartz, CaF_2, Ge and Si, polyethylene Fresnel lenses and Al or Au mirrors are used to converge or focus the infrared radiation. In order to limit spectral response, band-pass filters can be used.

Next, infrared detectors are used to detect the radiation which has been focused. The output from the detector is usually very small and hence pre-amplifiers coupled with circuitry are required to further process the received signals.

4. The Key Applications of Infrared Technology

Night Vision Devices

Infrared technology is implemented in night vision equipment if there is not enough visible light available to see unaided. Night vision devices convert ambient photons of light into electrons and then amplify them using a chemical and electrical process before finally converting them back into visible light. *Read more about infrared technology in night vision devices here.*

Infrared Astronomy

Infrared astronomy is a field of astronomy which studies astronomical objects that are visible in infrared radiation. By using telescopes and solid-state detectors, astronomers are able to observe objects in the universe which are impossible to detect using light in the visible range of the electromagnetic spectrum.

Infrared observatories have been set up in space such as the Spitzer Space Telescope and the Herschel Space Observatory have been set up in space. The observatories are not affected by the absorption of infrared light by water vapor in the Earth's atmosphere.

Infrared Tracking

Infrared tracking, also known as infrared homing, is a missile guidance system which operates using the infrared electromagnetic radiation emitted from a target to track it. These missile systems are often known as 'heat-seekers' as infrared is radiated strongly by hot bodies such as people, vehicles and aircraft.

Art History and Restoration

Infrared reflectography is used by art historians in order to reveal hidden layers in paintings. This reflectography technique is useful in helping to decide whether a painting is an original version or a copy, and whether it has been altered by restoration work**.**

Hyperspectral Imaging

Hyperspectral imaging accumulates and processes information from across the electromagnetic spectrum and can be used to track nanoparticles inside large living organisms.

5. Other Key Application Areas

Other key application areas that use infrared sensors include:

- Climatology
- Meteorology
- Photo biomodulation
- Gas detectors
- Water analysis
- Anesthesiology testing
- Petroleum exploration
- Rail safety

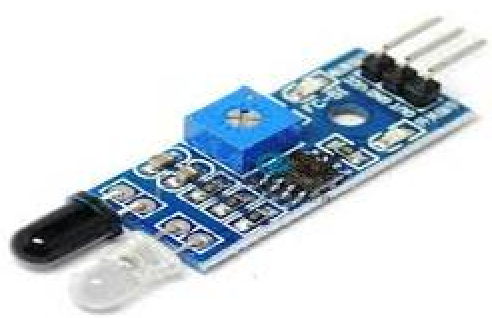


Fig. 3 IR Sensor

2. Servo Motor:

A **servomotor** is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system.

Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

More sophisticated servomotors use optical rotary encoders to measure the speed of the output shaft and a variable-speed drive to control the motor speed. Both of these enhancements, usually in combination with a PID control algorithm, allow the servomotor to be brought to its commanded position more quickly and more precisely, with less overshooting.

Servos are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse and a repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movement. The motor's neutral position is defined as the position where the servo has the same amount of potential rotation in the both the clockwise or counter-clockwise direction. ATEMGA 328 is 8-bit microcontroller used as the CPU of the system.

On this system we are going to implement total three features as below

- Turning head lights with steering
- Turn ON/OFF headlight
- Turn Side light ON/OFF

We decided to give first priority to the turning of head lights as that is the event that can occur at any time. Then second priority goes to turning head lights ON/OFF. And last priority goes to changing the state of the side indicators. Event of turning the headlight will be triggered with help of the IR sensor. As we aware with the IR sensor principle we will place two IR sensors on either side of the steering at the predefined angle. IR transmitter will be connected with steering and receiver will be places on either side as steering turns transmitter will also get turned and transmitted signal will be received by the receiver and it will generate pulse that pulse will be considered as the trigger for indication of turning of steering and accordingly we will start the rotation of the servo motor. Turning OFF/ON state of the headlight will be decided on the day light intensity. LDR will be used to sense light intensity when light intensity is less headlights will gets turned on. Side indicators are used mostly in foggy conditions and that condition can be determined with help of moisture sensor. And moisture level will be used to turn side light ON/OFF. In order to execute this we are going to code the micro controller with the embedded C and Aurdino IDE will be used to compile the code.

Fig. 4 Servo Motor

3. Microcontrolar:

A microcontroller (MCU for microcontroller unit) is a small computer on a single metal-oxide-semiconductor (MOS) integrated circuit (IC) chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals.

Microcontroller is a compressed microcomputer manufactured to control the functions of embedded systems in office machines, robots, home appliances, motor vehicles, and a number of other gadgets. A microcontroller is comprises components like - memory, peripherals and most importantly a processor.

Microcontrollers are embedded inside devices to control the actions and features of a product. Hence, they can also be referred to as embedded controllers. Microcontrollers can take inputs from the device they controlling and retain control by sending the device signals to different parts of the device.

CALCULATION

BASIC CONCEPT DESIGN CALCULATION:

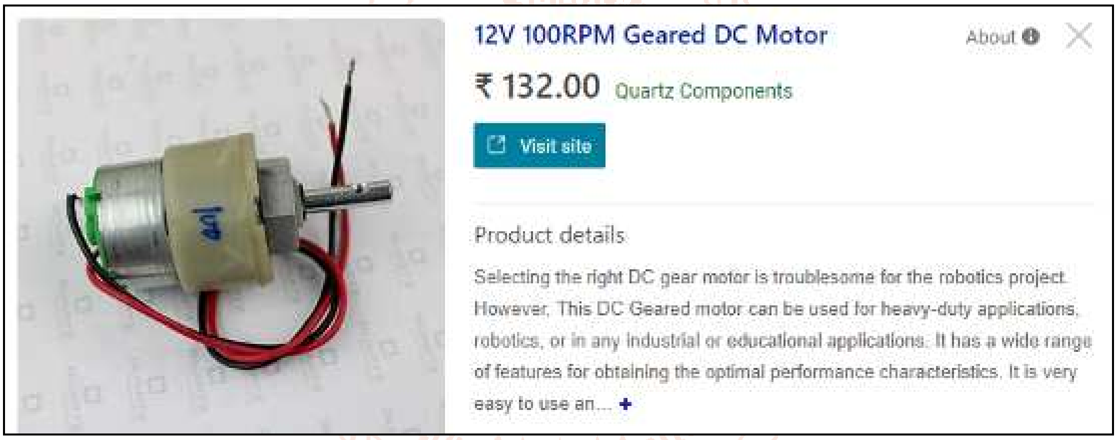
MOTOR SELECTION:

Consider, Weight to be lifted = 200 gram
Total weight of the vehicle = 600 gram
So total weight applied on the motor is 754 gram
Factor of safety is 1.3
Total weight is 1000 gram = 1kg = 10N
Radius of wheel = 31.5mm

Torque Required = Force* Radius of Pinion
= 10 X 0.0315
= 0.315 Nm

For this actual torque we have to select the motor having the torque greater than that of the actual torque. So, we will select the motor from the availability in the market.

Motor Specifications:
Voltage = 12V Amp = 5A
Power = P = 60
Speed = N = 1000 Rpm



We know that, P = 2*π*N*T/60

So, T =0.572 Nm

The motor torque is greater than required torque.

Hence the selection of motor is right.

6. 3D MODELLING

9 Key Advantages of 3D CAD Modelling in Mechanical Engineering Design

There are many benefits of 3D CAD modelling in mechanical engineering design. Here are 9 reasons to opt for 3D CAD modelling in mechanical engineering design.

1. Improves quality of the design: 3D CAD software comes with over 700,000 standard templates of mechanical components. Using 3D CAD modelling for mechanical engineering design allows designers to use the existing templates, thus ensuring the accuracy of the design, and also saving the design time
2. Increases productivity of the designer: 3D CAD modelling helps the designer visualize the mechanical component in 3D at the initial stage itself and make any changes instantly, if needed. This enhances productivity of the designer as he doesn't have to revisit the design at a later stage
3. Easy documentation: The traditional methods of drafting involve manually documenting various aspects of the mechanical component, which is a tedious process and need high levels of accuracy. 3D CAD modelling makes the entire process of documenting component designs easy, as it comes preloaded with flexible documentation options - like documenting geometries and dimensions of the product, material specifications, bill of materials, etc.
4. Compatible with International standards: Designing with 3D CAD ensures that the designs are compatible with international standards. CAD supports BSI, ANSI, DIN, CSN, GB, ISO, and GOST drafting platforms. Being compliant with

industry standards improves internal communication and results in better outputs

5. Automatic redrawing of design: Redrawing the hidden parts of components is a troublesome task for the designers using traditional drawing techniques. 3D CAD automatically redraws lines and dashes of the parts hidden from other mechanical parts of the design. If there is any change in design, 3D CAD automatically redraws the lines and dashes, thereby eliminating the chance of any error
6. Reduces design time: Getting a virtual 3D CAD model in the design phase aids in faster development and helps the mechanical engineers complete the design and get into the manufacturing of the mechanical component much faster
7. Better visualization for clients: 3D CAD modelling provides the best visual images of the component to be designed in 3D. The components can even be animated and the working can be observed. Visual graphics helps the customer understand the features and properties of the component better. This further helps in demonstrating the functionality of the mechanical component to the client, and making a proposal
8. Saving of data and drawings: The designs created on CAD can be easily saved for future reference. Some of the standard components need not be redesigned and this saves a lot of time for future designs creation
9. Saves cost: 3D CAD comes with many standard designed components which saves the designer from the trouble of designing them again from scratch. This saves crucial time and money. Also, obtaining the licensed modelling software is expensive hence outsourcing 3D CAD modelling is the preferred option, as it helps in saving the costs further

3D Modelling is an expansion on the concept of two-dimensional drafting that began to rise in popularity in the early 2000's. By adding a third dimension there is exponentially more information that can be included in the resulting model. Three-dimensional models in AEC design are typically for buildings and building systems, however, they can be utilized for individual components and fixtures for fabrication as the building gets closer to construction. Models are created in the early stages of a design project and are used as the foundation for designers to bring designs into reality in the form of detailed construction drawings, images, and renderings. The benefits of working in three-dimensional space over traditional drafting are that it allows architects and engineers to more clearly understand the conditions of a design. The design of building systems is complex and can be utilized to more clearly represent projects to other designers, builders, and clients. Models make it is possible to make large changes to design with relative ease as the drawings are based on 3D geometry instead of line work. By making changes easier designers are able to more easily coordinate with trades and consultants after presenting design options. If all members of the design team are working in 3D it is possible to have a complete digital representation of the design and all of its systems. This also opens up other opportunities for coordination such as clash detections and material quantities to be more accurately estimated to help keep project costs low. Other information can also be included in a model, such as glazing information for windows, hardware information for doors, pipe flows, mechanical system volumes, and electrical design loads. This information component allows projects to have more information incorporated into the design reducing the potential for coordination errors and miscommunications. Once the project is complete, the design model acts as a record model for the owner and any future maintenance teams. By having a model, designers are able to put forth a more accurate design to ensure a project functions properly and last for decades. The more accurate the information is at the start of a project the better decisions the solutions that can be designed. These decisions allow projects to meet building codes and requirements for functionality that are critical for both owners and users of a building. Computer-aided design (CAD) is the use of computers to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for print, machining, or other manufacturing operations [12].

CAD is used as follows:

1. To produce detailed engineering designs through 3-D and 2-D drawings of the physical components of manufactured products.
2. To create conceptual design, product layout, strength and dynamic analysis of assembly and the manufacturing processes themselves.
3. To prepare environmental impact reports, in which computer-aided designs are used in photographs to produce a rendering of the appearance when the new structures are built.

CAD systems exist today for all of the major computer platforms, including Windows, Linux, Unix and Mac OS X. The user interface generally centers around a computer mouse, but a pen and digitizing graphic tablet can also be used. View manipulation can be accomplished with a space mouse (or space ball). Some systems allow stereoscopic glasses for viewing 3-D models. In our olden days, engineers, designers and draughts men were struggling to produce and submit engineering drawings in their scheduled times. It was mainly due to tremendous efforts they had taken to produce both new drawings or edited/updated drawings. Every lines, shapes, measurements, scaling of the drawings - all made them headache to the design / drafting field. All these difficulties and pressures over-ridden by **Computer Aided Design Drafting (CAD Drafting)** technology [12].

The advantages of CAD include: the ability to producing very accurate designs; drawings can be created in 2D or 3D and rotated; other computer programmes can be linked to the design software. With manual drafting, you must determine the scale of a view before you start drawing. This scale compares the size of the actual object to the size of the model drawn on paper. With CAD, you first decide what units of measurement you will use, and then draw your model at 1:1 scale, should one of the main benefits of CAD. When you draft manually, you first select a sheet, which usually includes a pre-printed border and title block. Then you determine the location for views' plans, elevations, sections, and details. Finally, you start to draw. With CAD, you first draw your design, or model, in a working environment called model space. You can then create a layout for that model in an environment called paper space.

A layout represents a drawing sheet. It typically contains a border, title block, dimensions, general notes, and one or more views of the model displayed in layout viewports. Layout viewports are areas, similar to picture frames or windows, through which you can see your model. You scale the views in viewports by zooming in or out. Manual drafting requires meticulous accuracy in drawing line-types, line-weights, text, dimensions, and more. Standards must be established in the beginning and applied consistently. With CAD, you can ensure conformity to industry or company standards by creating styles that you can apply consistently. You can create styles for text, dimensions, and line-types.

With manual drafting, you use drawing tools that include pencils, scales, compasses, parallel rules, templates, and erasers. Repetitive drawing and editing tasks must be done manually .In CAD, you can choose from a variety of drawing tools that create lines, circles, spline curves, and more. You can easily move, copy, offset, rotate, and mirror objects. You can also copy objects between open drawings. With manual drafting, you must draw objects carefully to ensure correct size and alignment. Objects drawn to scale must be manually verified and dimensioned. With CAD, you can use several methods to obtain exact dimensions. The simplest method is to locate points by snapping to an interval on a rectangular grid. Another method is to specify exact coordinates. Coordinates specify a drawing location by indicating a point along an X and Y axis or a distance and angle from another point. With object snaps, you can snap to locations on existing objects, such as an endpoint of an arc, the midpoint of a line, or the center point of a circle. With polar tracking, you can snap to previously set angles and specify distances along those angles. Revisions are a part of any drawing project. Whether you work on paper or with CAD, you will need to modify your drawing in some way. On paper, you must erase and redraw to make revisions to your drawing manually. CAD eliminates tedious manual editing by providing a variety of editing tools. If you need to copy all or part of an object, you don’t have to redraw it. If you need to remove an object, you can erase it with a few clicks of the mouse. And if you make an error, you can quickly undo your actions. Once you draw an object, you never need to redraw it.

To work efficiently using the cad the organisation must focus on the following areas where it needs to be on upper side.

1. Most popular CAD software like AutoCad, ProgeCAD, Microstation are high priced for individuals. Alternatively, individuals can try free opensource CAD drafting software QCAD, LibreCAD and OpenSCAD.
2. Every new release of the CAD software, operator has to update their skills.
3. Improper use of blocks and layers make updating and modification of the drawings a cumbersome task for another person.

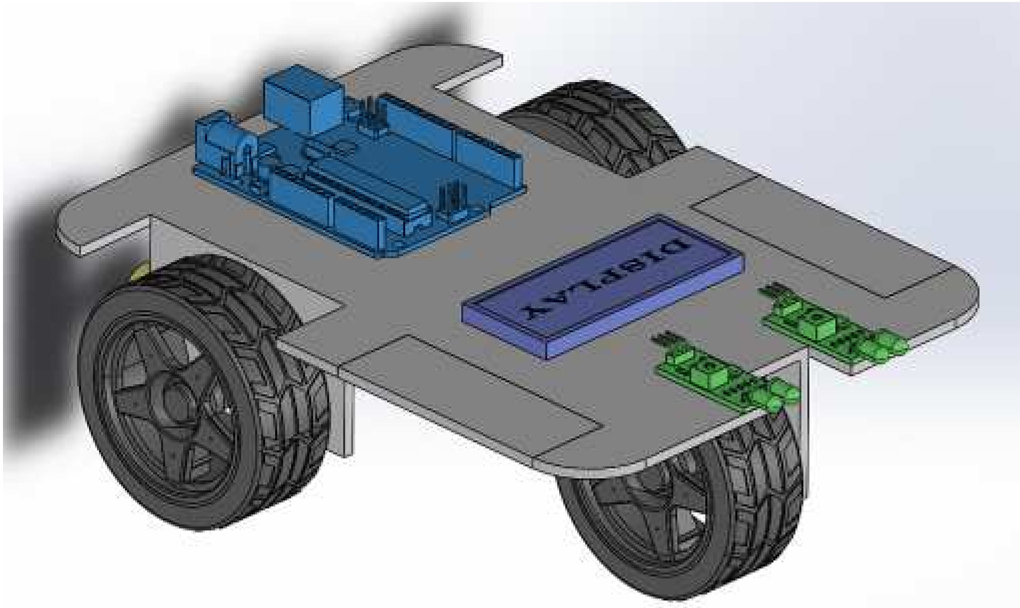


Figure 1 - AGV Isometric View

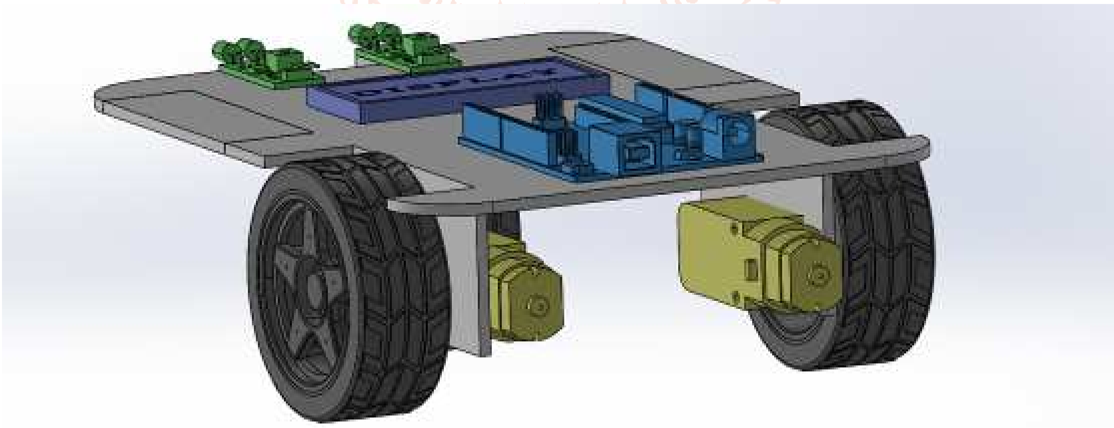


Figure 2 - Isometric View

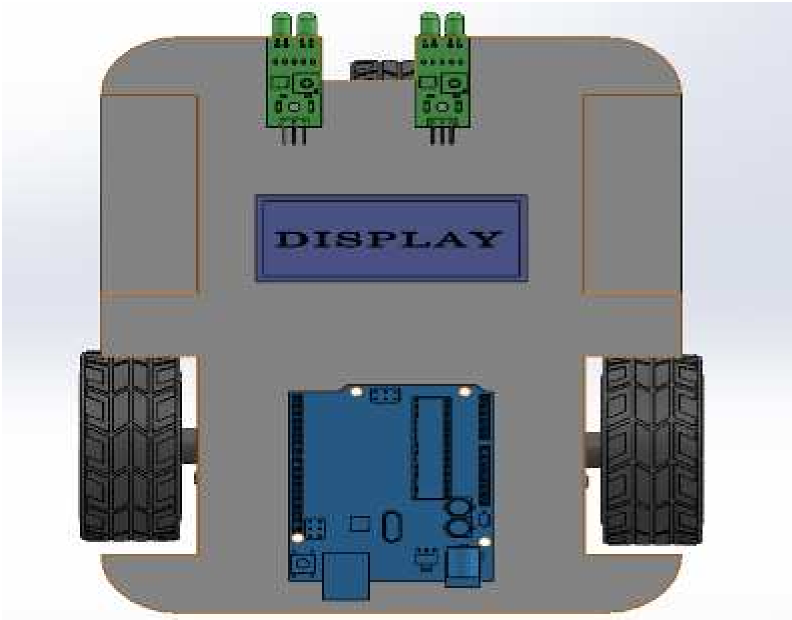


Figure 3 - Top View

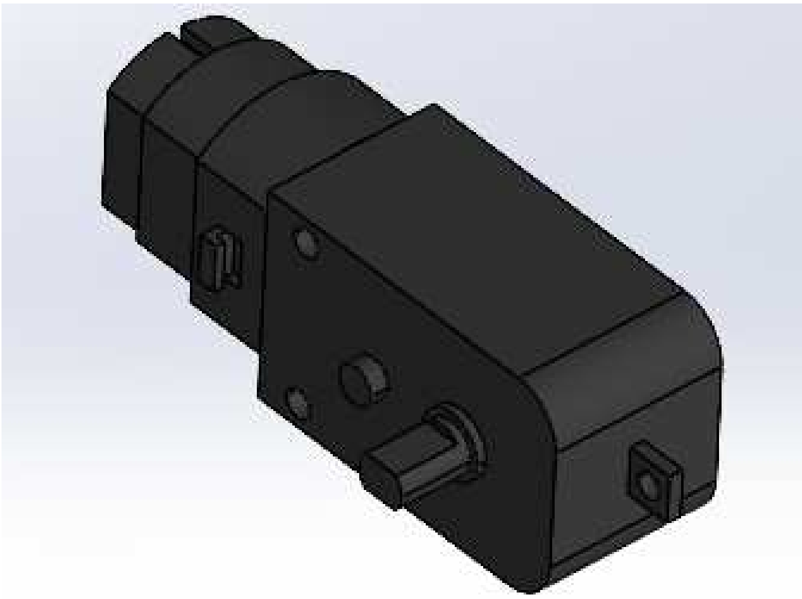


Figure 4 - 12V DC Motor

Figure 5 - Wheels

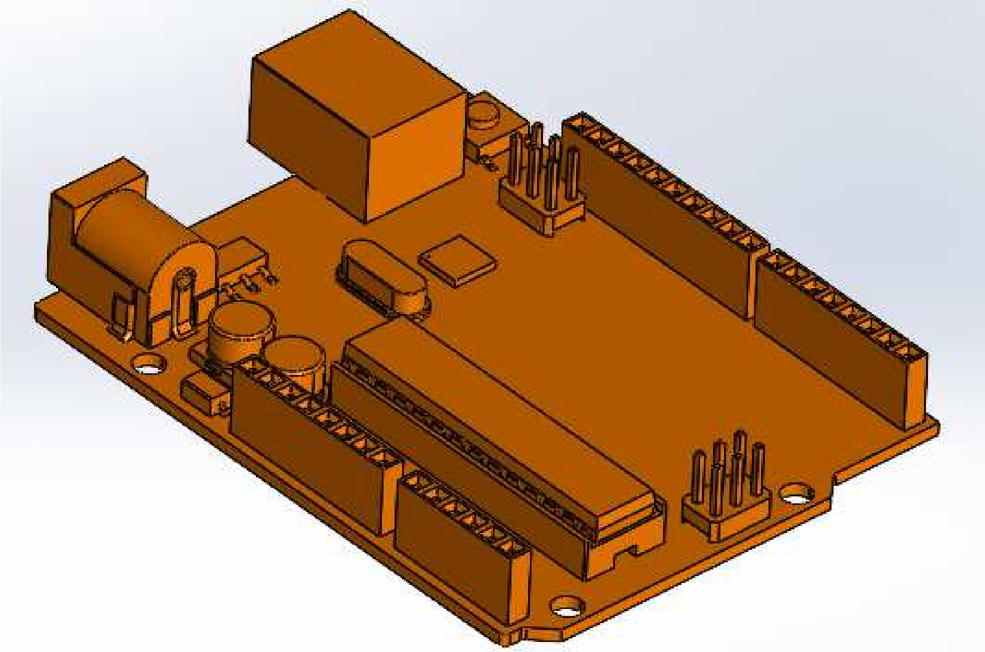


Figure 6 - PCB

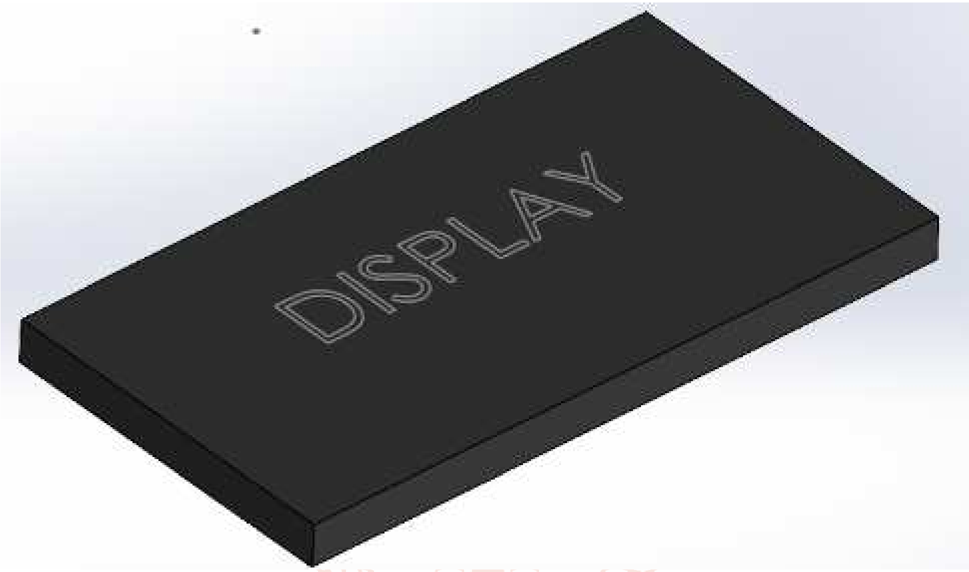


Figure 7 - Seven Bit LED Display

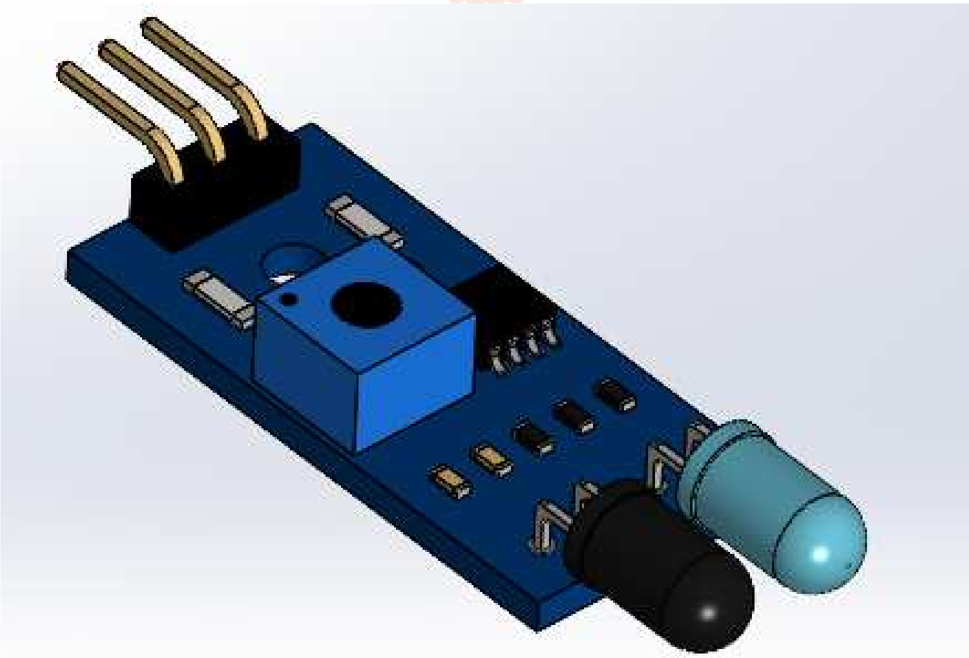


Figure 8 - IR Sensor

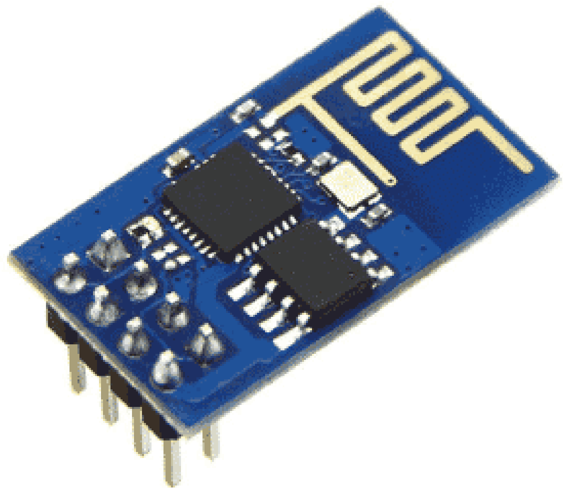
COMPONENTS SECIFICATIONS

Microcontroller

- IC type: AVR microcontroller.
- Core size: 8-bit.
- Speed: up to 20MHz.
- Number of I/O: 23.
- Program memory size: 32Kb (16K x 16)
- Program memory type: Flash.
- EEPROM size: 1K x 8.
- RAM size: 2K x 8.

IOT Module

- 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2).
- General-purpose input/output (16 GPIO).
- Inter-Integrated Circuit (I²C) serial communication protocol.
- Analog-to-digital conversion (10-bit ADC).
- Serial Peripheral Interface (SPI) serial communication protocol.
- I²S (Inter-IC Sound) interfaces with DMA(Direct Memory Access) (sharing pins with GPIO).
- UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2).
- Pulse-width modulation (PWM).



IR sensor

- 5VDC Operating voltage
- I/O pins are 5V and 3.3V compliant
- Range: Up to 20cm
- Adjustable Sensing range
- Built-in Ambient Light Sensor
- 20mA supply current
- Mounting hole

Load cell

- Capacity: 5KG
- Rated output(MV/V): 2.0±0.15
- Accuracy class: C2
- Maximum number of laod cell verification intervals(N max): 2000
- Minimum number of laod cell verification intervals(Vmin): EMax/5000
- Combined error(%RO): <±0.030
- Creep(%RO/30min): 0.03
- Temperature effect on sensitivity(%RO/°C): 0.0016
- Temperature effect on zero(%RO/°C): 0.003
- Zero balance(%RO): 1.0
- Input resistance(O): 402±6
- Output resistance(O): 350±3
- Insulation resistance(MO<50V>): 5000
- Recommended excitation voltage(V): 10~15

Bluetooth module

- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 4V to 6V (Typically +5V)
- Operating Current: 30mA

- Range: <100m
- Works with Serial communication (USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread spectrum (FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth
- Supported baud rate: 9600, 19200, 38400, 57600, 115200, 230400, 460800.

DC motor

- Operating Voltage(V): 12.
- Rated Speed (RPM): 200.
- Rated Torque(kg-cm): 1.5.
- Stall Torque(kg-cm): 5.4.
- Load Current (A): 0.3.
- No Load Current (A): 0.6

LCD display

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is build by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

L293D motor driver

- Can be used to run Two DC motors with the same IC.
- Speed and Direction control is possible
- Motor voltage Vcc2 (Vs): 4.5V to 36V
- Maximum Peak motor current: 1.2A
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to Vcc1(vss): 4.5V to 7V
- Transition time: 300ns (at 5Vand 24V)
- Automatic Thermal shutdown is available
- Available in 16-pin DIP, TSSOP, SOIC packages

Lead Acid Battery

- Voltage: 12V
- Capacity: 1.3Ah
- Size: 98mm x 43mm x 52 mm
- Weight: 0.450kg
- Rechargeable

- Recyclable
- No Memory Effect
- Able to use for most of the 12V controllers, motors or any other appliances

7. COST ESTIMATION:

Cost estimation may be defined as the process of forecasting the expenses that must be incurred to manufacture a product. These expenses take into a consideration all expenditure involved in a design and manufacturing with all related services facilities such as pattern making, tool, making as well as a portion of the general administrative and selling costs.

PURPOSE OF COST ESTIMATION:

1. To determine the selling price of a product for a quotation or contract so as to ensure a reasonable profit to the company.
2. Check the quotation supplied by vendors.
3. Determine the most economical process or material to manufacture the product.
4. To determine standards of production performance that may be used to control the cost.

TYPES OF COST ESTIMATION:

1. Material cost
2. Machining cost

Material Cost Estimation

Material cost estimation gives the total amount required to collect the raw material which has to be processed or fabricated to desired size and functioning of the components.

These materials are divided into two categories.

1. Material for fabrication:

In this the material in obtained in raw condition and is manufactured or processed to finished size for proper functioning of the component.

2. Standard purchased parts:

This includes the parts which was readily available in the market like Allen screws etc. A list is forecast by the estimation stating the quality, size and standard parts, the weight of raw material and cost per kg. For the fabricated parts.

Machining Cost Estimation

This cost estimation is an attempt to forecast the total expenses that may include manufacturing apart from material cost. Cost estimation of manufactured parts can be considered as judgment on and after careful consideration which includes labor, material and factory services required to produce the required part.

PROCEDURE FOR CALCULATION OF MATERIAL COST:

The general procedure for calculation of material cost estimation is after designing a project,

1. A bill of material is prepared which is divided into two categories.
   a. Fabricated components
   b. Standard purchased components
2. The rates of all standard items are taken and added up.
3. Cost of raw material purchased taken and added up.

SR. NO.	COMPONENT	COST
1.	MICROCONTROLLER	1000
2.	IR Sensor	200
3.	motor	700
4.	Frame	1500
5.	LCD display	1000

Total Cost = Cost of Components + Cost of Machining = 7000/-

8. PLANNED PROPOSED WORK

Sr. No	Activity/month	July 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22
1	Search of topic									
3	Finalizing of project									
4	Literature review									
5	Basic diagram and study of components									
6	Cad diagram and starting the calculation of components									
7	Calculations									
8	Finalizing the calculations and preparing the final cad diagram with dimensions									

9	Starting manufacturing						■	■		
10	Buying the standard components from market							■		
11	Testing of model								■	
12	Rough draft of report								■	
13	Final report									■

LITERATURE REVIEW

[1] AUTOMATED GUIDED VEHICLE Manali Pohare, Ashok Shinde and Prashant Borkar student, MMIT under the guidance of Prof Snehal Koparde, International Journal of Scientific & Engineering Research, Volume 6, Issue 4, April-2015.

Vision guided robotics plays a vital role in all research areas. The basic idea our project is to increase the visual system of humans. The other major aim of our project is to develop intelligent machines. AGV is one kind of transportation that follows the given respective paths and route. It is widely used industrial fields and community services as well as in dangerous working areas .Nowadays AGV are used in almost all the countries .It has many advantages in our day to day life. IT works just like a robot as it is able to sense and respond in the given environment. Considering that AGVs are used to optimize our work in almost all the fields. In this project we develop a prototype of an AGV which follows a given path on a flat surface with the help of two dc motors and one freewheel. Camera is interfaced with PC for image acquisition and processing is done with the help of Matlab. Path can be determined by the user with the help of GUI application. RF module is used for communication between PC and microcontroller .Commands can be sent from PC based on location of vehicle. Microcontroller will then move the vehicle forward, left, right and stop

[2] Wireless Control of an Automated Guided Vehicle, Rajeev K Piyare, Member, IAENG, and Ravinesh Singh.

This paper represents the design, implementation, and experimental results of a Radio Frequency (RF) based wireless control of a distributed Peripheral Interface Controller (PIC) microcontroller based Automated Guided Vehicle (AGV), which is known as ROVER II (Roaming Vehicle for Entity Relocation). ROVER II was designed in-house as a general purpose guide path following mobile platform for material handling and transportation within a manufacturing facility

[3] Design and Methodology of Automated Guided Vehicle-A Review, Suman Kumar Das1, M.K.Pasan2 1 (Department of Mechanical Engineering, NIT Jamshedpur, INDIA) 2 (Professor, Department of Mechanical Engineering, NIT Jamshedpur, INDIA), IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320–334X.

In this paper, we study the design and different methodology of automated guided vehicle (AGV) systems. This paper provides an overview on AGVS technology discusses recent technological developments and describes the formulation to control the traffic inside industrial work space.

[4] Multi-sensor information fusion for Internet of Things Assisted Automated Guided Vehicles in Smart City, Ahmad Ali AlZubi1*, Abdulaziz Alarifi2, Mohammed Al-Maitah3, Omar Alheyasat4 1,2,3 Computer Science Department, Community College, King Saud University, Saudi Arabia 4 Computer Engineering Department, Faculty of Engineering, Al Balqa Applied University, Jordan

Smart transportation is one of the important factor in the smart city environment because it enhance the citizen lives style and improving the sustainability. Driverless Automatically guided vehicles rely on environmental information for performing target-oriented movements and navigation. Handling multiple information from the environment is a complex task though, these information are necessary for improving the realization of these vehicles. Therefore, considering the significance of sensor data in this guided vehicle environment, this article introduces Responder dependent Additive Information Fusion (RAIF) scheme. This scheme observes the responding sensor information for determining the achievement level of the target endorsed for the guided vehicle. The multi-instance sensor information is gathered from the Internet of Things (IoT) based connected devise.

[5] Locating workstations in tandem automated guided vehicle systems, Amir Salehipour & Hamed Kazemipoor & Leila Moslemi Naeini, Int J Adv Manuf Technol (2011) 52:321–328 DOI 10.1007/s00170-010-2727-y.

This paper presents a new solution framework to locate the workstations in the tandem automated guided vehicle (AGV) systems. So far, the research has focused on minimizing the total flow or minimizing the total AGV transitions in each zone. In this paper, we focus on minimizing total cumulative flow among workstations. This objective allocates workstations to an AGV route such that total waiting time of workstations to be supplied by the AGV is minimized. We develop a property which simplifies the available mathematical formulation of the problem. We also develop a heuristic algorithm for the problem. Computational results show that our heuristic could yield very high-quality solutions and in many cases optimal solutions.

CONCLUSION

1. In this semester we develop the literature survey with the help of research paper.
2. The 3D modelling and design of the automatic guided vehicle is done using CATIA software.
3. The selection of the motor is done by considering the weight caring capacity.
4. Market survey of the component is done and purchase of component is also done.
5. Overall cost estimation is also done.

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