

Fabrication of Smart Solar Based Fire Fighting Automated Guided Vehicle (AGV)

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College : *New Horizon College of Engineering, Bangalore*
Branch : *Department of Mechanical Engineering*
Guide(s) : *Prof. Vinod Kumar G S*
Student(S) : *Mr. Abhishek Yadav*
Mr. Ajay A M
Mr. Dhanush S
Mr. Sai Samhith Duvvada

Keywords:

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Introduction:

In most facilities, a fire extinguisher is the first line of defence; hence, it should always be in optimal working condition. Unfortunately, there are numerous instances of fire extinguishers jamming during fire outbreaks. AGV fire extinguisher is a portable robot that follows lengthy defined lines or cables down. AGVs were once employed in transmission lines, but as technology has evolved, AGVs are also used in container storage, and underground. Frequently used to transport heavy duty items to industrial regions, such as warehouse or a factory. In the late 1920s, the usage of automatic guided vehicles became more widespread. A century has passed, Barrett Electronics Corporation created the first PC-based industrial vehicle in the world. Applications were submitted in 1954, AGV was employed for several purposes at the same time as well.

This AGV is portable and may be utilized for variety of tasks, including fire extinguishing and spray painting, for example, or a bomb diffusion device. We've devised a creative robot concept that can be fully automated. AGV fire extinguisher is an automated fire extinguisher. It works with batteries and is built with environmentally friendly materials. The creation of a smart solar powered automated



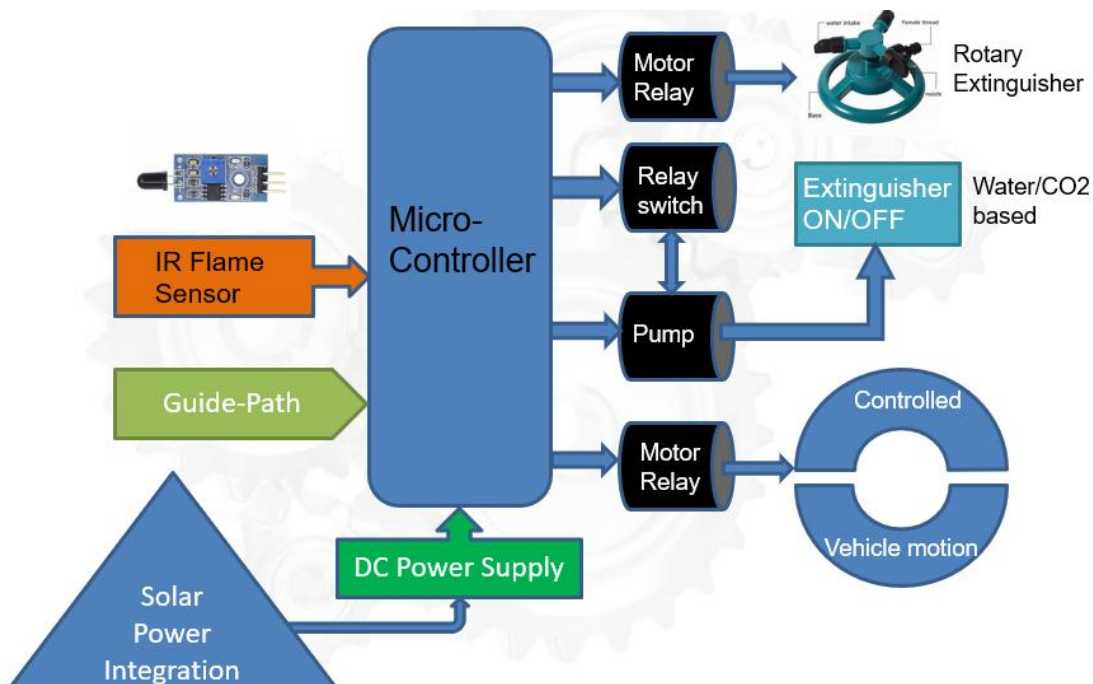
guided vehicle for fire-fighting (AGV) is eco-friendly. For firefighting, water is utilized in the same way as a regular fire extinguisher is used. That's how the fire is extinguished by

directing and putting out the fire in the designated area, reduces the likelihood of an accident and it is essential for human safety

Objectives:

- To prevent human intervention in fire incidents. Fully automatic and easy to control.
- To uplift safety systems in an older hospital, and residential building that meets modern safety standards.
- Quick response to early fire accidents.
- Unmanned Line supervising for shop floor safety.

Methodology:



Work flow: :

The vehicle is moving from one place to another place using IR sensors underway detecting the existing path created as part of building plan. Suppose, any fire flame is detected by the sensor, the vehicle automatically stops moving and the following operation occurs. When the Flame sensor, mounted along with the extinguisher, detects the fire ahead and signals are processed as follows: The signal obtained by the sensor is sent to the amplifier which is the basic information for the micro controller. Once the sensor and motor controllers are verified to work, we can proceed to the automatic mode. In this application note, all the computation is done in the motor controller using programming scripts. In a practical implementation, the AGV throttle will be controlled by an external device, such as a

PLC. The PLC must then be connected to one of the motor controller's inputs through a communicating interface via a Bluetooth application that is created using 'MIT APP Inventor'.

This automated guided vehicle is designed by keeping in mind the various factors like portability, eco-friendly, low cost, and user friendly. The main objective of this vehicle is to eliminate human intervention with the fire incident and reduce the fatalities that occur. The brain behind the working of this vehicle is the Arduino UNO microcontroller that is powered by a 12V lead acid battery. Two IR proximity sensors are used for automated guided system and a flame sensor is used to detect that fire. To drive the vehicle there are two geared DC motors used and two more are used for control of extinguisher and to actuate the extinguisher opening. The base of the extinguisher base that it sits on can rotate 135° right to left which is controlled by a worm gear attached to the DC motor. A rack and pinion setup are made use for the actuation of the extinguisher. All the DC motors are connected to two 4-channel relay module that can send signals from and to the microcontroller. A Bluetooth module is also incorporated control the vehicle.

Conclusion:

- The chassis was designed as per requirements to carry extinguisher load and accommodate all the components like motors, wheels, electronics, etc.
- All the components like motors, their relays, sensors, wiring harness, connectors, panels, and miscellaneous equipment were procured and assembled after chassis fabrication.
- The Circuit was created around the microcontroller to function the auxiliaries like battery power and its charging through solar panel, all the sensor connections for to and fro communication, DC motors and their relay modules for propelling the components.
- ABC class fire extinguisher was chosen for moderate safety.
- The Charging time of the battery through Solar panel is around 5-6 hours and model run time is approximately.
- The working of this model is limited to only to follow guide path but it can be operated 2 modes-AGV until sensing and extinguishing fire and then reverting back by Bluetooth control.
- The present Arduino used is UNO and in future obstacle avoidance is feasible with addition of ultrasonic sensor which can be possible with microcontroller having higher no of pins allowing extended operating inputs.
- There were 2 iterations carried out before successful development of rotary mechanism for extinguisher casing to detect the fire in front region.

Scope for future work:

- The Smart Automated Guided Vehicle can be made to run completely on renewable energy like solar energy instead of using battery. However, maintaining constant input voltage throughout using solar energy is a challenge.
- The better efficient power generating rechargeable batteries can be deployed to increase the run time of Smart Automated Guided Vehicle. But, incorporating these batteries will increase the overall cost of the project.

- The design can be made more compact and handier in nature.
- The weight of the Smart Automated Guided Vehicle can be reduced by using Alloys & other engineering materials for chassis keeping in mind the cost factor.
- The range of the sensors can be improved which can assure better accuracy as far as operating ranges are concerned.
- Microcontroller board with more features can be incorporated to increase the capability of the system and to be able to install other circuitries or sensors.
- An alarming based sensor can be also be installed which can alert the stations about fire detection and can be used as an indicator to evacuate the place.
- The Smart Automated Guided Vehicle can be also be fully automated by replacing the human operator with a robot to control the movements and operations of the vehicle.
- In future, this Smart Solar Based Fire Fighting Automated Guided Vehicle can be used in multiple ways to minimize the chances of accidents and will play a vital role in enhancing human safety in place the place of operation.