

# Design and Implementation of an Unmanned Ground Vehicle for Autonomous Firefighting Missions

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**Abstract**—This paper presents a design and implementation of an unmanned ground vehicle (UGV) for outdoor firefighting application. The proposed UGV firefighting system consists of a self-designed robot as platform, a transmission system to collect and release water and a mission control system to monitor and coordinate the UGV. In our proposed autonomous cooperative framework, the UGV finds an optimal path (with respect to distance and power consumption) to the fire spot at first. After arriving at the target on fire, the mission control system will guide the UGV to suppress the fire.

## I. INTRODUCTION

Firefighting is a highly difficult and challenging task for human beings which requires reaching the target place in a short period, identifying the fire spot and suppressing the fire efficiently.

The existing human involved firefighting system has following major drawbacks:

- (1) Firefighters safety cannot be guaranteed
- (2) Requires additional effort to detect fire and actuate device
- (3) Accessibility to hazard area has been limited.

Hence, some sort of automation is required in such complex firefighting missions. Our proposed project is on design and implementation of an unmanned ground vehicle (UGV) for firefighting application. The proposed UGV firefighting system consists of a mission control system to monitor and coordinate the UGV. In our proposed autonomous cooperative framework, fire detection sensors will be deployed in our testing environment and upon

receiving alert signals from these sensors, the mission control system will guide UGV to find an optimal path (with respect to distance) to the fire spot at first. After arriving at the target on fire, the mission control system will instruct the UGV to suppress the fire.

## II LITERATURE SURVEY

The proposed framework has been demonstrated in the 2015 International Micro Aerial Vehicle Outdoor Competition [2], held in Aachen, Germany and helps our team V-Lion obtain the second place. Our designed framework has successfully achieved all the requirements in firefighting mission even in a challenging wind gusts environment.

## III EXISTING SYSTEM

The current existing system for firefighting missions involves human effort. It is a manual method and highly challenging task. Modern technology is not involved in firefighting missions.

## IV PROPOSED SYSTEM

Our proposed system detects the fire spot in our testing environment, alerts the mission control system and will guide the unmanned ground vehicle to find an optimal path to the fire spot. After arriving at the target on fire, the mission control system will instruct the unmanned ground vehicle to suppress the fire.

## V METHODOLOGY

Initially the environment which is subjected to fire extinguishing need to be deployed with fire detecting sensors. If any fire accidents occur in that environment will be detected by the sensor. The sensor transmits the signal to the controlling system with the occurrence of fire. The system computes an optimal path to the fire accident spot, which will be communicated to the UGV. While moving towards the accident spot if the UGV finds any obstacle it will inform the controlling system. Once again an optimal path will be computed and it will be given to the UGV. The UGV will reach the destination and will suppress the fire then it will acknowledge the control system.

## VI APPLICATION

This system is suited for various applications due to its high mobility.

It has high sensing ability.

It helps in outdoor disaster surveillance.

It can be used in multiple highly risky applications such as search and rescue.

It helps in traffic condition monitoring and forest fire management.

## CONCLUSION

Autonomous firefighting is a challenging task, due to the lack of portable firefighting system. We have presented an approach that will effectively guide the UGV and accurately helps in firefighting. The ultimate objective is to build a low cost firefighting package that can be incorporated in to multiple platforms.

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