

## ABSTRACT

### THE DEVELOPMENT OF FIRE DETECTION ROBOT

Hilmi Saygın SUCUOĞLU

M.Sc. Thesis, Department of Mechanical Engineering

Supervisor: Prof. Dr. İsmail BÖĞREKÇİ

2015, 211 pages

The aim of this thesis is to design and manufacture a fire detection robot that especially operates in industrial areas for fire inspection and early detection. Robot is designed and implemented to track prescribed paths with obstacle avoidance function through obstacle avoidance and motion planning units and to scan the environment in order to detect fire source using fire detection unit. Robot is able to track patrolling routes using virtual lines that defined to the motion planning unit.

The design and implementation processes of the robot are as follow; the design and the development of mechanical, electronic systems and software. The design and the development of mechanical system; for the sketch drawings, dimensioning and solid state modeling of the robot, computer aided design and solid modelling computer programs were used. The carrier board of the robot is produced using wooden material and rigid plastic foam which are cheap, strong enough and easy to manufacture. Differential steering method is selected for semi-autonomous robot driving system and it is powered by four brushed DC (direct current) motors. The design and the development of electronic system; electronic circuits were designed and produced, instead of buying a commercial card. Both schematic diagrams and circuits of the data acquisition and control circuits are designed using Proteus electronic design program. These circuits are used to control the motion of the motors and establish a data flow between the laptop and the other peripheral sensing components. Software development; intelligent algorithms for obstacle avoidance and path tracking have been developed. A sensor data fusion algorithm for the sensors was also developed to get more reliable fire detection information.

In conclusion; a fire inspection and detection robot with various functions to especially can be used in industrial areas was designed and manufactured. The functions of the robot were tested. It can be concluded that system is able to detect the fire source maximum 100 cm distance away while robot is moving with 0.5 m/s forward speed.

**Keywords:** Data acquisition and control, Differential steering method, Firefighting, Sensor data fusion, Virtual path tracking.