**EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES**

**ABSTRACT:**

Forest and urban fires have been and still are serious problem for many countries in the world. Currently,

there are many different solutions to fight forest fires.These solutions mainly aim to mitigate the damage caused by the fires, using methods for their early detection. In this paper, we discuss a new approach for fire detection and control, in which modern technologies are used. In particular, we propose a platform that uses Unmanned Aerial Vehicles (UAVs), which constantly patrol over potentially threatened by fire areas. The UAVs also utilize the benefits from Artificial Intelligence (AI) and are equipped with on-board processing capabilities. This allows them to use computer vision methods for recognition and detection of smoke or fire, based on the still images or the video input from the drone cameras. Several different scenarios for the possible use of the UAVs for forest fire detection are presented and analyse in the paper, including a solution with the use of a combination between a fixed and rotary-wing drones.

**INTRODUCTION:**

The most up to date information on the current fire season in Europe and in the Mediterranean area is

provided by the European Forest Fire Information System EFFIS . Each year this institution provides annual report on the forest fires in Europe, the Middle East and North Africa. According to the latest report, which they provided for 2017, the dramatic effects of wildfires have caused damages of over 1.2 million hectares burnt natural lands in the EU and killed 127 people, including fire fighters and civilians. Over 25% of the total burnt area was in the Natura 2000 network, which destroyed much on the efforts of the EU countries to preserve key natural habitats and to save the biodiversity of Europe for the future generations. The same report says that these fires caused estimated losses of around 10 billion euros. Despite these large numbers, EFFIS informs also that the report is showing a decrease in the number of fires, compared to the number of fires, which occurred annually during the last decade. This decrease can be explained with the more severe actions and sanctions to the people that caused the wildfires and with the introduction of more advanced technical solutions for early detection of fires. Obviously, the fight against fires can mitigate the damages, but the numbers, which represent the burnt area and the human lives, are still huge. This reason presents the necessity to constantly develop, implement and upgrade the solutions and systems for fire detection. The most important factors in the fight against forest fires include the earliest possible detection of the fire event, the proper categorization of the fire and fast response from the firefighting departments.

The aim of the proposed platform is not only to use

modern technologies, but also to improve the above

mentioned factors by reducing the fire detection time, by

minimizing the false alarms and by issuing of timely

responses and notifications to the fire services in case of

real forest fires. In the paper, we discuss the proposed platform for early forest fire detection, which involves two types of UAVs – a fixed-wing drone and a rotary-wing drone. Both UAVs will be equipped with cameras, which will be optical, thermal or both. The fixed-wing drone will constantly patrol the monitored area and will observe the territory below. Since this drone will fly at medium altitude (350 m to 5500 m), it might report false alarms because of the altitude or the lack of clear visibility. If the fixed-wing UAV detects a fire, it will trigger an alarm, which will activate the rotary-wing drone. The rotarywing drone will then closely inspect the area, where the fire is suspected to have occurred, by using the GPS coordinates provided by the patrol drone. The role of the second drone is to either confirm or reject the alarm bases on its close observation of the area and will then go back to its base station. It will not permanently monitor the targeted area. The reason to use a second drone is to reduce the number of false-positive alarms as the rotary wing drone will fly at much lower altitude (10 m to 350m) compared to fixed-wing UAV and will have better and more detailed visibility of the area. If the fire is confirmed, another alarm will be triggered by the rotary-wing drone and the ground level teams and the fire protection departments will be informed. The platform is completely automated since both drones have on-board computers and processing capabilities.

They can detect fires based on the data captured by their thermal cameras and they can process this data without the need for centralized computing engine. In addition and to further improve the platform, we have planned to implement artificial intelligence by allowing the drones to make fire predictions based on computer vision techniques. In order to implement this artificial intelligence solution we will rely on and use neural networks. The neural networks are currently a very hot topic in the computing systems, because of their ability to “learn” how to perform tasks by considering examples, without being programmed or instructed to follow specific rules. The neural networks are inspired by the biological neural networks that constitute human brains.

**PROBLEM STATEMENT:**

**How might we prevent the forest firenby early detecting methods?**

For early detecting of forest fire by using,

* Detects by smoke/flame/spark.
* Detects by temperature,climate changes and humidity.
* Detects spark due to lightning.
* Detects any electronic stortage that can cause fire.
* Detects intentional acts of arson.
* Detects the forest fire using CO2.
* Powerful CCTV and HD cameras are used.
* Regularly removes dry leaves
* IR fame detectors are used
* Install and maintain the smoke alarms
* By satellite monitoring,Monitors 24/7

By detect the forest fire we can reducing and solving the problems,

* Reduces the air pollution.
* Reduces the landslides,soil erosion by protecting strong rooted trees.
* Reduces the risk of eradication of endngered species.
* No need of manual monitoring.
* Reduces the emission of CO2 into the air during fire.
* No loss of life and resources.
* Regular maintainance.
* Highly safe since no involment of human life.
* No need of manual monitoring.

**CONCLUSION:**

The system for early forest fire detection is still in its development stage. We are still waiting for some equipment to be purchased, but we have planned and discussed the actual implementation. We have performed a thorough research and some simulation experiments and we believe that we follow the right way to achieve the goal. We also believe that we apply adequate approach that is also up-to-date. We think that the system could enhance the available platforms for fire detection and we hope that such improvement could significantly reduce the damages caused by untimely or late fire detection.