Wildfires consume millions of acres of land every year and cause billions of dollars of damage [1]. The spread of wildfire can be prevented by knowing the current state of the wildfire and the way in which it is spreading from its origin. By knowing the above information, we can try to prevent the spread by deploying the appropriate mechanisms. There exist some ways like doing satellite photography and computer simulations, but the former lacks high resolution and does not provide precision and the later does not provide real-time tracking.

**Methodology**

**Wildfire Model**

A wildfire model is made to simulate a platform to prepare and test the regulator. A fire spreading model which was grown before is made utilized [14]. At first, a 1 Km * 1 Km zone of room was partitioned into little cells. The huge zone was isolated as a 100 * 100 framework, where every cell has an area of 10 m * 10 m. The considered territory is little contrast with the real world, yet the idea can be easily scaled to huge zone of grounds to be utilized for real world scenarios. Two factors of interest to oversee every cell:

i. Here F(s) denotes the remaining quantity of propellant in the cell “s” can be burned.

ii. Here B(s) denotes a binary value ( 0 or 1 ) represents the condition ; cell is burning or not.

The elements of the cell may undergo modifications in three different mechanisms for each of the update in wildfire. The estimation of F(s) will continue diminishing as the fire is burning as the consuming fire burns-through fuel. At the point when the estimation of F(s) arrives at 0, the fire will be quenched in the cell “s”. For cells that are not consuming and have a non-zero estimation of F(s), a worth p(s) is defined that demonstrates the probability of that cell burning into flames dependent on its separation to different cells that are consuming. The wildfire spreading conditions that are utilized are

\[
F(s) = \begin{cases} 
\text{max}(F(s)), & \text{if } B(s) = 1 \\
F(s), & \text{otherwise} 
\end{cases}
\]

\[
p(s) = \begin{cases} 
1 - L - (1 - L) \cdot e^{-\gamma s}, & \text{if } F(s) > 0 \\
0, & \text{otherwise} 
\end{cases}
\]

The below demonstrated fig 3 indicates the simulation of the forest fire outbreak for two unique situations, one is without wind and the other is with wind throughout a time span of 150s. Every cell starts with a random estimation of F(s), the value which lies among (15,20) and the fire drouses at an alternate time at every cell. As it is demonstrated the out-of-control fire spreads in a roundabout manner during the absence of wind and the fierce blaze outbreak is more towards the east which is the direction of the breeze. Thus, the UAV should be equipped for keeping a track of rapidly spreading fire precisely under the numerous vulnerabilities brought about by stochastic and wind conditions and wind conditions.

**POMDP Approach**

There is a requirement for executing POMDPs in multi-UAV frameworks. If all the agents in the autonomous units performing cooperatively there will be an enormous expansion in productivity and spares a great deal of time during vulnerabilities while it is contrasted with the single operators conducting exclusively.

**UAV Model**

At the point when the current directions of the UAV is \((x,y)\), has a non-changing velocity \(v\) and gravitational power of \(g\), the state and the directions of the UAV can be resolved by using the below formula

\[
\dot{x} = v \cos \psi, \quad \dot{y} = v \sin \psi, \quad \dot{\psi} = \frac{g}{v} \tan \alpha
\]

**Analysis and Results**

We have utilized mission Planner, Adaptool and real-time map in order to get the simulation results. The tasks are executed in the Linux environment. Below mentioned screenshots are the proof of the simulation results. The below figure 4 demonstrates the wildfire spreading across the forest area during the course of time. In the output image, the orange spots portray the area where the fire is burning. The brown area denotes that the area is already burnt due to forest fires and the green spots depict that the fire has not yet reached those area in the forest.

The relatively detectable MDPS is a mind-boggling system to express continuous decision for the cluster-based networks with multiple autonomous agents (UAVs) which are working cooperatively to locate the best way to arrive at the focal points with efficient state space.

In this project, we have introduced a simulation of cluster-based networks for taking care of restricted sensor data. The simulation can be utilized for a real time guidance framework, for multi agents which are collaboratively cooperating with each other to recognize the effective way of thinking about a point of action.

**Summary/Conclusions**

We enjoyed working on the project and appreciate having had this amazing opportunity to work with our advisor Professor Jonathan Ponniah and extend our thanks to our coordinator Dr. Binsen Sinicke for being supportive throughout the course of this project.

We are grateful to the Electrical Engineering Department for providing the required tools and resources for the successful completion of the project.

**Acknowledgements**

As mentioned, the simulation of cluster-based networks for taking care of restricted sensor data. The simulation can be utilized for a real time guidance framework, for multi agents which are collaboratively cooperating with each other to recognize the effective way of thinking about a point of action.

**Key References**


