Airboarned Optical-enabled & Energy Entropy Based Wildfire Detection & Prediction Scheme

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Abstract:

The likelihood of a fire event, the intensity of the fire, and the effect of fire in terms of the burn area are essential in fire risk analysis. Recently, forest fire spread modeling was used to quantify national forest fire exposure of Portuguese communities and protected areas to large fires, as a response to support the national plan for future forest fire risk mitigation. The main objective is to establish early detection, warning, and prevention of wildfires to save lives and for rescue purposes in remote areas. Through this wildfire detection system, the cause, source, and spreading of wildfires could be controlled and minimized in remote sites. As a result, this proposed wildfire detection scheme will be a potential method for life protection, property preservation, and conservation of natural resources such as wood and vegetation.

The most significant advantage of UAV deployment is data encryption/decryption at desired height and location in real-time. Therefore, the captured view of wildfire locations by UAV improves the probability of early detection warning and provides prediction of wildfire sites.

Based on the data collection, the point-to-point system (IR camera-UAV link) is optimized along with the performance analysis of the link. Further, the performance analysis is simulated and calibrated with the experimental data of the system. Thus, we will develop a UAV-based optical detection and prediction mechanism.

Atmospheric moisture and its role as a greenhouse gas (GHG) must be considered to determine the total effect of GHGs in the destruction of SEC. The present study shows the possible formation of very localized black holes creating very low densities. The study is based on several laws and publications. The detection of such low densities becomes an important parameter in detecting critical conditions, particularly with superheated water as thermal eddies. They may also cause fires because of combusting low molecular weight hydrocarbons. Furthermore, downstream wind flow should also be considered in determining the kind of instrumentation and evaluation of results. The wind direction and velocity will also depend on the energy generation of electromagnetic radiation from thermal power generations like nuclear power. The higher the reaction temperatures, the lower the entropy, causing much concern for low densities of moisture and other GHGs. An entropy-based fire prediction model will be developed based on the energy balance equation in this proposal. Finally, this project will combine the entropy-based model with the UAV-assisted optical wireless system, together with developed sensors within the framework of this project.

The project also ensures the European practice of diversity and inclusiveness. We employ 2 female researchers and 5 male researchers. In the search for other MSc student recruitment, we will prioritize sexually diverse groups. The results of the project will be used to submit larger grant proposals in Horizon Europe. Also, the contributed knowledge will be shared among fellow researchers in Portugal and Europe. Additionally, various outreach events are planned to improve public awareness.

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