For consideration under COVID -19 Initiatives by NITs

Title: Drone automation solution for surveillance and delivery

Category: Surveillance

OUTCOME/ABSTRACT/DESCRIPTION:

Aim

It is aimed to develop drones for achieving the following objectives -
1)Tracking people autonomously without human interference and inform authorities about cases of lockdown violation and crowd gathering
2)Automation of announcements and disinfectants spraying
3)Delivery of essential goods, medical equipment and medicines between preset locations.

Description

The current pandemic, COVID-19 or Coronavirus, has affected more than 20 lakh people worldwide and 1 lakh people have died. In India, almost 12 thousand people have been affected, and out of those, nearly 400 have died. Hence it is necessary to prevent crowd, create awareness and to deliver essentials to the people without human intervention.

Specific Need:

Crowd prevention:

- Since there is no vaccine developed yet, preventing this virus from spreading is the only way. Social distancing is the only option we have. To achieve this, GoI has ordered a lockdown on all movement, except those working in the essential services.
- But we see that many are violating this lockdown, which increases the risk of coronavirus by many times. So we propose to use a drone to monitor the locality and find the places where crowd gathering occurs.
- Many task forces have been deployed on the ground, but these are inadequate for monitoring and covering a more extensive range.
- Also, current drone usage relies on an operator and can cover a small range.
- Our drone will have the capability of covering a broader area and can detect people through the aid of computer vision. The usage of an ML model will be looked into.

Automation:

- A significant disadvantage in India is people's inability to understand the seriousness of this situation. Even though warnings and announcements are being circulated in social media and continuously played in radio and television, people are not listening to it.
- So we propose to use drones to inform the general public about the Dos and Donts in this pandemic.
- The announcements can be in the regional language of that area, and we can cover a full region.
- Also, similarly, we can use it for spraying disinfectants over remote or rural areas.

Delivery:

- The proposed solution includes the delivery of required medicines and health equipment in case of emergency as well as following social distancing in this pandemic situation.

- This idea can be embedded with some app or web service that will make it easy to use for all users in case of any medical emergency.
- The delivery will be done between a few fixed points, so that the drone will take a pre-planned route, avoid obstacles and safely navigate its way.

Methodology

It is proposed to carry out these tasks by developing an intelligent autonomous drone. In literature Evolutionary algorithms (EA) have been successfully used to compute near-optimal paths through obstructed, dynamically changing environments. Explicitly accounting for the uncertainty of the obstacles can result in the survival of "best" paths which differ from those that would be favoured in a purely deterministic environment. In this work, we consider the application of evolution-based path planning to the motion of an unmanned air vehicle (UAV) through a field of obstacles at uncertain locations.

Stepwise procedure to carry out the work

• Developing the static form of the EA algorithm for generating a path at a single point in time to show its behaviour, how it responds differently based on the known accuracy of the predictions of the environment

• Extension of static structure to consider the uncertainties which change with time

• Control of drones under uncertain environmental conditions by suitable model based control algorithms

• Demonstration of path planning in drone through a field of moving obstacles whose future motion is uncertain

• Compare the results with other path planning techniques like potential fields, graph search methods.

The usage of drones will be beneficial and overcomes any issue of cost because of its simplicity, more extensive range and adherence to government guidelines. The design parameters for the drone includes payload capacity, range, trajectory planning and tracking, obstacle avoidance and operation time.

Expected Time-line: 3-6 months

Remarks: Funding requirement -Rs. 2.5 Lakhs

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