Automated Drone Surveillance for Fleet of Police Drones

Introduction

Preventing crime can be quite hard if police officers cannot get to the crime scene in time and get to the perpetrator in time. This tends to be the case for most muggings and assaults. More recently, drones are being used in a more automated way which opens up the world for an automated drone police system. Drones would prevent risking lives as well as bring a sort of authority to certain alarming situations. This technical review paper will summarize the current market for automated drones, commercially available automated drones already in use or in development, current implementation to obtain a working drones, and problems that could be faced when building one.

Current Market for Automated Drones

Since, companies around the world are aiming for more automation and efficiency as opposed to human interaction, drones and unmanned aerial vehicles are picking up steam. Most current commercial uses for drones include surveillance, inspection of a product, and delivering items of high value from one place to another, especially when the destination is a very remote and inaccessible region [1]. Excluding any government use of drones, the major uptick in commercial use of drones is especially centered in construction work, mining, agriculture (surveying land, spraying pesticide, and so on), surveying, and real estate [4]. Most of the current uses of drones are drones that are still being controlled by some human being. This is predicted to change based on massive commercial funding into machine learning solutions that would allow drones to control themselves based on a function they would have to complete [3].

Big companies such as Amazon and Google are pushing for self-controlled drones that would deliver packages to customers [5][6]. Google's project X Wing, which has recently teamed up with FedEx and Walgreens, has started testing autonomous delivery drones in Finland, Australia, and the United States where the drone drops off a certain medicine from Walgreens to a particular customer location. Using machine learning, the drone will decide where to drop off the package [5].

Currently, on the market, there are very few to no commercially available products that are truly autonomous drones. There are many consumer kits and instructions online on how to build a rudimentary one at home, but all the commercial ones are either under development or testing . This can be seen in the numerous start-ups that are attempting to use real-time Artificial Intelligence and Machine Learning to allow drones to pick out people in a crowd, understand zones of danger such as fire, uses in construction and farming and so on [7].

Technology and Implementation for Autonomous Drones

Drone

The primary components necessary for an autonomous drone is flight hardware and machine learning software. Drones, necessarily, need propeller fans, motors and a battery at a bare minimum [8]. Then to add to that would be a flight controller which would contain software to maintain proper flight stabilization along with the intended actions and movements [8]. The flight controller would need to take input for direction, altitude, and direction of movement [8]. This would also need to account for weather and surrounding objects to prevent any collisions [9].

Autonomous Part

To make a drone partially if not completely autonomous, the drones would need a bunch of sensors attached to the drone with a relatively powerful controller. A big requirement for any autonomous drone is that it should not collide with objects around it while completing actions required of the drone [9]. Sensors that could be used are light rangers, motion sensors, sonars and cameras to be able to sense the environment and check if there are any obstacles nearby [9]. This along with a finite state machine like algorithm that is able to set the velocity, direction and other aerodynamic variables [9]. These features would make a rudimentary autonomous drone. This along with machine learning, object recognition, and face or people recognition would allow for a drone to be able to do tasks with potential human interaction and in the outdoors [5].

Problems of a Potential Autonomous Drone

Legal

Autonomous drones by definition need to get input from the surrounding potentially in the form of video coverage and sound coverage [2]. On top of that, drones need to be able to fly at a certain altitude and location [2]. These necessary features potentially go against certain federal and state laws regarding privacy regulations, Federal Aviation Administration (FAA) regulations, and general safety concerns about a flying battery pack with powerful motors and propeller [2]. Luckily, there are not too many FAA regulations that exist yet, and would slowly get updated or created as more research and development happens with companies [2].

Power

Autonomous drones need quite a bit of equipment to operate and this needs a source of energy to sustain all its functions such as motors for flying, sensors for direction, and machine learning controllers and processors for completing its needed operations. This delimiting factor needs to be balanced with the overall weight of the drone and how much drone can carry and for how long.

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