NEXT LEVEL INNOVATION IN ROBOTICS AND AUTONOMY

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Title: **Autonomous UAV Swarms** **Abstract:**

A critical class of useful applications for surveillance, environment monitoring, automated agriculture, dealing with natural disasters, automated construction, etc., involve unmanned aerial vehicles (UAVs) or drones which need to operate in swarms in order to be effective. However, till date such large swarms of UAVs are effective only when they are remotely controlled by a centralized ground or aerial platform which does all the computing and decision-making. This aspect makes such systems dependent on an external controller and cannot be termed as autonomous. Autonomy demands that these systems should operate independent of any external decision-making entity which, in turn, would require each UAV in the swarm to be able to behave intelligently in sharing information with other UAVs in the swarm and acting upon the information received from them in a coordinated fashion. At first sight, this requires an enormous amount of computing power, a reliable communication system, and intelligent decision-making software, at each drone. However, it may not always be necessary to do all kinds of computation by each drone but rather share the combined computing resources of the swarm in an intelligent manner such that in addition to the standard distributed computing carried out by each swarm member they can also share their resources to carry out compute-intensive tasks. We will illustrate this critical class of applications, with an example involving UAV swarms for dealing with natural disasters like floods which, on completion, will be implemented as a complete system in UK and India. A second example involving two UAVs carrying a spring-loaded rigid bar will also be discussed.