Introduction: Space has interested humanity since dawn of time, and modern technology has greatly increased our possibilities for deep space exploration. We will in this work address several significant challenges associated with prospecting distant planets using a novel, wirelessly connected swarm of smart drones.

New Way to Survey Planets with Drones

The planetary survey issues:
Space missions are associated with very high costs from design to final deployment. We sought to improve this by rethinking the typical mission model.

Strengths and Drawbacks of the conventional ways in fig. 1:
- (a): No landing issues. Disadvantages of High power consumption for the long range scanning, rough surveying data collected.
- (b): More detailed data collected by the robot. Disadvantages include some landing issues with the heavy object. Also, if the robot is down, so many difficulties for the replacement will ensue.

Steps for the proposed method:
1. Landing drones from the satellite:
   - A lot of drones are enveloped in shock absorbing airbag.
2. Planetary survey by the individual drones:
   - The drones are assembled at the appointed time.
3. Phased array system
   - The drones can go anywhere and collect very detail survey data.
   - The assembled drones make a formation with the communication system for the drone formation and for the transmitting/receiving signals to/from other drones.
4. The drones can cooperate in order to form the phased array system as shown in Fig. 4.

Advantages of the proposed planetary survey method:
1. Multi-functionality
   - One T/R system works for both terrain survey and phased arrays for satellite communication
2. Replaceability:
   - We can send extra drones from the satellite during the landing
3. If some drones are down, extra drones can take the places
4. Low Cost:
   - A single drone is far cheaper than the survey robot
   - When some drones are down, we can restore it with low cost
5. High Feasibility
   - It uses the typical techniques of phased array system and drone formation
6. Detail Data Collection
   - The drones are highly mobile shown in Fig. 4(b).
7. Mitigated landing issue
   - Drones are light, fast and mobile

Conclusion
We have briefly presented the usage of drones for formation of phase array antenna system simplifying communication with an orbital satellite. The drones can be used for planetary exploration and yield great benefits in reliability, total project cost and mission flexibility as compared to the conventional single-lander mission.

References:

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