## Aramco Upstream Solution Technathon 2019

## Robotics challenge: Design of a UAV based sensor deployment logistics system

**Problem:** In oil and gas exploration operations, large number of seismic sensors need to be relocated repeatedly for seismic acquisition. A substantial part of the cost when operating a seismic crew is going towards vehicle maintenance, fuel and crew expenses (accommodation, food and labor, i.e. operating costs). The current practice involves hundreds of people through manual installation and relocation of sensors, which is inefficient, logistically complicated and not friendly for environment approach.

**Solution:** Using swarm of UAVs to deploy seismic sensors saving unit cost per sqkm and aiming towards “green seismic acquisition surveys.

**Details of the challenge:** In this Robotic challenge, the participants will be given detailed description of the sensor locations (receiver grid). Each drone is equipped with the vibration sensor (accelerometer like ones at smartphones). The vibration sources position and signal characteristics will be provided. Each source will work on periodic schedule: 12s sweeping time + 6sec listening time + 1min relocation time. Each drone must land on predefined location, wait until next sweeping+listening cycle to record the data and then move next. Sometimes drones must get back to the station for recharge and data upload. To make it more complex each drone can have its own battery life time. The data acquisition time will be limited.

The participants are expected to program swarm of drones to achieve two goals:

1. Navigate drones to the provided receiver locations with good accuracy to record data.
2. Optimize logistics (flying distance, recording time, battery charging time) to demonstrate best performance.

All participants are expected to use virtual environment Gazebo (<http://gazebosim.org/>) to test and demonstrate their solutions. The winner solution will be uploaded to real swarm of drones and demonstrated live.

**Evaluation of the performance:** The team that manage to collect largest amount of recording points (full length datasets on disk, size of the data may vary due to application of the data compression which is a plus) is getting highest technical score. The other evaluation criteria include novelty, practicality, thinking out of the box, presentation performance and answering questions.

**Data for challenge:** XY locations of the recording points and drone base (the base can be moving for more complexity).

**Hardware:** Aramco Innovations can provide 5 high-end workstations with ROS+Gazebo (robotics programming and simulation environment) installed. Skoltech Robotics Lab can provide swarm of 10 small drones and special cameras for control for live demonstration of the most successful solution.