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Abstract

Objectives/Scope:
Due to the outdoor nature of the oil and gas industry, there are a number of potential use cases for UAV to take its advantage of moving in an unstructured environment and accessing remote areas. In this paper, current and potential Unmanned Aerial Vehicle (UAV) applications for oil and gas industry are summarized. The technical constrains and potential breakthroughs for achieving these applications are also discussed.

Methods, Procedures, Process:
There are two major categories of industrial UAV applications, using UAV as an inspector and as a carrier. Inspection type UAVs are extensively exploited in downstream applications where airborne visual and thermal imaging are used for the inspection of pipelines, plants and other infrastructures. 3D mapping/modeling is another important feature that brings UAV inspectors into the upstream domain, for geological modeling and explorations. Carrier type UAV represents the next generation of UAV which utilize its mobility and payload as a service, it has shown great potentials in sensor deployment for exploration and offshore logistics applications.

Results, Observations, Conclusions:
Oil and gas industry represents a primary use field for UAV applications. For downstream inspection applications, UAV brings increased productivity and cost reduction to a number of conventional use cases. From technical side, inspection type UAV benefits from advancements in Microelectromechanical system (MEMS) technologies where high performance, low power and light weight sensors made it possible for UAV to gain in-air perception with extended flying time. Power efficient onboard computation is another important aspect for UAV to advance in its 3D mapping/modeling capabilities. Limited payload and flying time are the major obstacles for the development of carrier type UAVs for the oil and gas industry. Optimized powering solutions such as solar panel equipped UAVs and gas engine UAVs can push the limit from one side, while optimized aerodynamics such as single and coax copter designs can be the solution from the other side.

Novel/Additive Information:
This work provides an in-depth analysis of the current UAV development for the oil and gas industry. By summarizing applications under different technology categories and discussing the advancements and constrains for each category, the paper provides a unique perspective to explore the future possibilities of oil and gas UAV applications.