Unknown environment motion planning with no world model is a daunting task, especially for higher order manipulators. Sensor based planning is a dominant trend for planners in unknown environments.

However, unknown environment planning, while important, still falls short of practical solutions for higher order manipulators.

One amelioration we propose is to make use of a ramification of model-based approaches with sensor based realtime rehearsal in cognitive sense.

Possible applications include autonomous sea base specimen sampling, robotic operations in crowded environments such as domestic indoor, hospital, and unexplored planets.
In this research, we propose a novel 3D vision sensor called Infrared Proximity Array (IPA),

IPA sensor is capable of detecting position and orientation of components or devices for automation and robotics applications.

An IPA is fabricated with some 300,000 sensor array utilizing infrared sensor technology to accurately measure distance and, thus, create 3D geometry of sensed objects.

A charge coupled device based sensor array has a potential to be further miniaturized for micro-systems with embedded processing for smart sensors.
Microelectromechanical systems (MEMS) are small, integrated devices or systems that combine electrical and mechanical components.

They range in size from the sub micrometer (or sub micron) level to the millimeter level. Bulk micromachining, one of the MEMS technologies, is an essential method to fabricate micro or nano scale structures on the pure silicon wafer.

Due to the precision sculpturing capability of a 3D structure the bulk micromachining became one of the most important technologies for nano structure manufacturing areas.