Report on Existing Modular Robots and Approach on Increasing its Functionality

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Based on the existing models of a Modular Robot or similar projects, we get to see a wide variety of methods used for control, data/power transmission, actuation, sensing.

All these methods have their own limitations and our modular robot would be primarily focusing on a low-cost, maximum capability (in terms of ability to sense the surroundings and moving from one place to another) approach.

The Dtto Modular Robot is the most promising option under the given time and resources as the body is 3D printed and system based on Arduino which is relatively easy to develop. To expand its capabilities, a number of things could be done:

- IR obstacle detection on all flat faces of the module. If this is done, it will help detect obstacles in any configuration and make decisions to avoid the obstacle.
- Add IR receivers on faces which can detect the IR sent from faces and locate other modules. Each face will transmit different IR codes so the receiving module will have some idea about its orientation
- Ultrasonic sensors could also be used for better immunity to lighting changes but they are bulkier than IR sensors. There are modules such as the MaxSonar EZ1, which are smaller than usual but still a bit bulky(roughly 2x2x1.5cm).
- Gyroscope to sense direction of gravity would help in making motion decisions.
- A camera module could be developed based of tiny FPV cameras used in RC Planes and drones. The sent video could be processed in a computer and used to send feedback to the Modules.
- Using a standalone MCU like the ESP32 which has built in WiFi+BLE would save lots of space and make room for more sensors.