Modular Drone Platform for Autonomous Sensor Swapping

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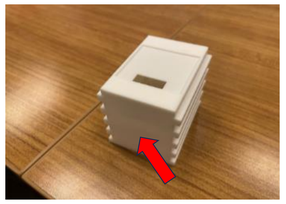
Introduction

Indoor drones provide unparalleled monitoring of buildings and other tight spaces. However, their small size creates a challenge in meeting the wide range of applications due to the limited number of sensors they can carry.

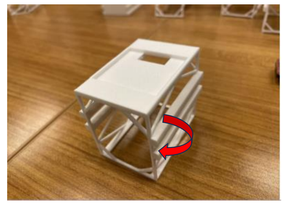
Objective: Create a modular drone platform for autonomous sensor swapping.

Swapping sensors would allow indoor drones to retain their small size whilst maintaining the wide range of tasks they can execute.

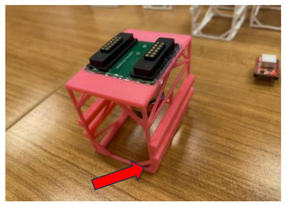
Sensor Module Design



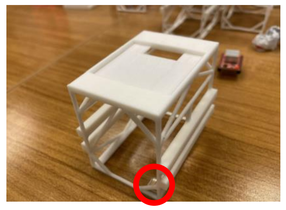
1st Prototype:
Too heavy, walls inhibit sensor function



2nd Prototype:
Laser sensor unable to determine position

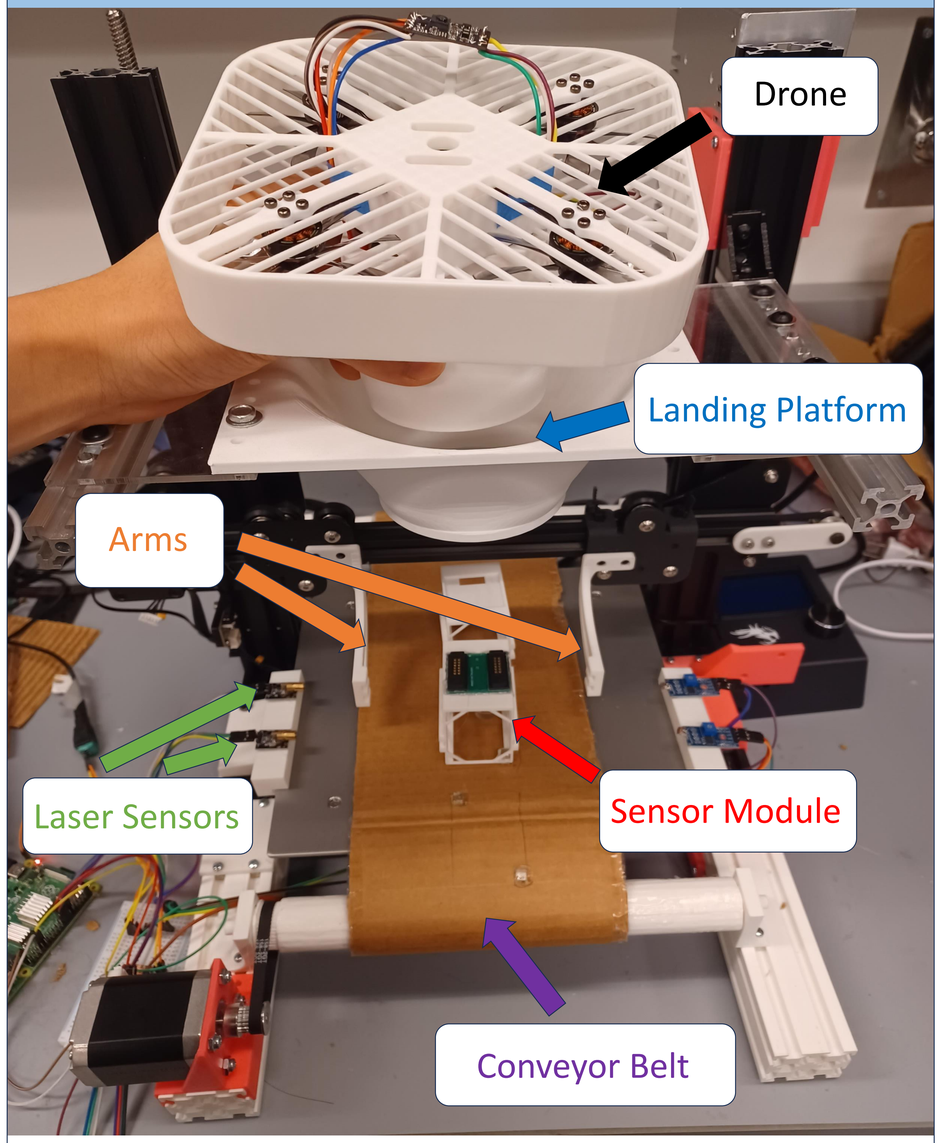


3rd Prototype:
Unstable while moving on conveyor belt



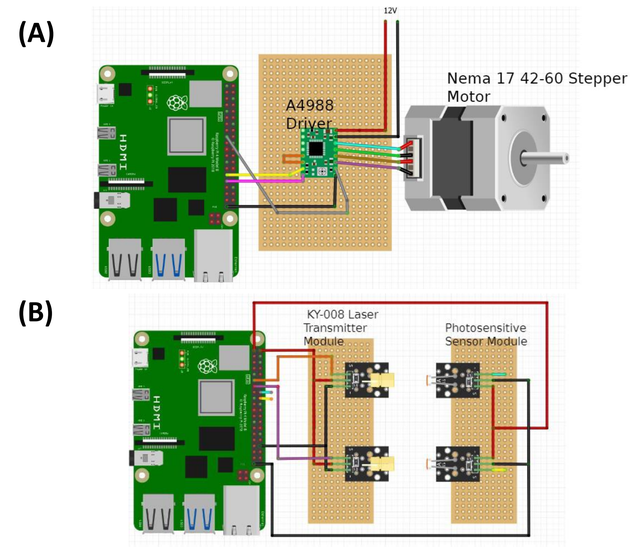
Final Prototype:
Embedded magnets secure it to conveyor belt

Drone Landing Platform



The basket-like design of the landing platform allows the drone to easily land in the correct position. The arms grab the sensor module below and attach it to the drone via a set of magnetic connectors, allowing it to fly away and execute a given task.

Platform Driver



A Raspberry Pi 4 was used to control the (A) conveyor belt motor and (B) two laser sensors. When the sensor module moves into position, it blocks the laser, triggering the conveyor belt to stop moving.

Future Directions

1. Test sensor and drone compatibility
2. Implement camera for sensor module tracking

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- The conveyor belt design was adapted from the Ender Loop project developed by Michael Sgroi, as per https://creativecommons.org/licenses/by-nc/4.0/

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