Flipkart GRiD 2.0

"Autonomous Indoor Drone"

Team Name : *Orbit*

Institute Name : *KIET Group of Institutions, Ghaziabad*

Team member details

Team Name	Orbit		
Institute Name	KIET Group of Institutions, Ghaziabad		
Team Members >	1 (Leader)	2	3
Name	Md. Aanis Noor	Pravesh Narayan Soni	Prateek Gupta
Batch	2022	2022	2022
Area of expertise	+Project Planning +Software testing/debugging +Computer Vision	+Embedded firmware +Hardware +Drone tech	+AI training +Software coding +UI

Functionalities of the UAV drone

- What all can the drone do?
  - + *Autonomous path traversal*
  - + *Carry/drop payloads up to 3kgs*
  - + *Detect obstacles and correct its path*
  - + *Show a camera-feed*

- What all activities can it perform?
  - + *Reach a defined height automatically*
  - + *Grab a payload; drop the payload*
  - + *Detect gates; go through them*
  - + *Move on its x-y axis automatically; z-axis fixed for this task*

- Are there any things that the drone can do above and beyond the requirement?
  - + *Can be tweaked to traverse other dissimilar paths*
  - + *Actual payload capacity > required payload capacity*

- Are there any out of the box functionalities?
  - + *Can read bar-codes for exact point delivery and other programmed functions*
  - + *Available on demand camera-feed*
  - + *Live (trained) object detection*

Drone specifications

Frame model / Material	Mini 290 (Carbon Fiber)
Frame wheelbase (mm)	290
Frame arm size (mm)	125 x 25 (L x W)
Multi-copter type	Hexacopter
ESC category	25A
Motor rating	2300kV BLDC
Propeller rating	5” 5030
Flight Controller	DJI Naza M-lite
Battery	3300mAh LiPO battery 3S
Claw servo	M-995 10kg Servo
Compass Module	HMC5883L
Master microcontroller	STM32F103C8
Camera for obstacle detection	Pixy2cam
IR Sensor for obstacle avoidance	Sharp GP2D12
RxTx	Radiolink R12DS pair

Robot/solution limitations

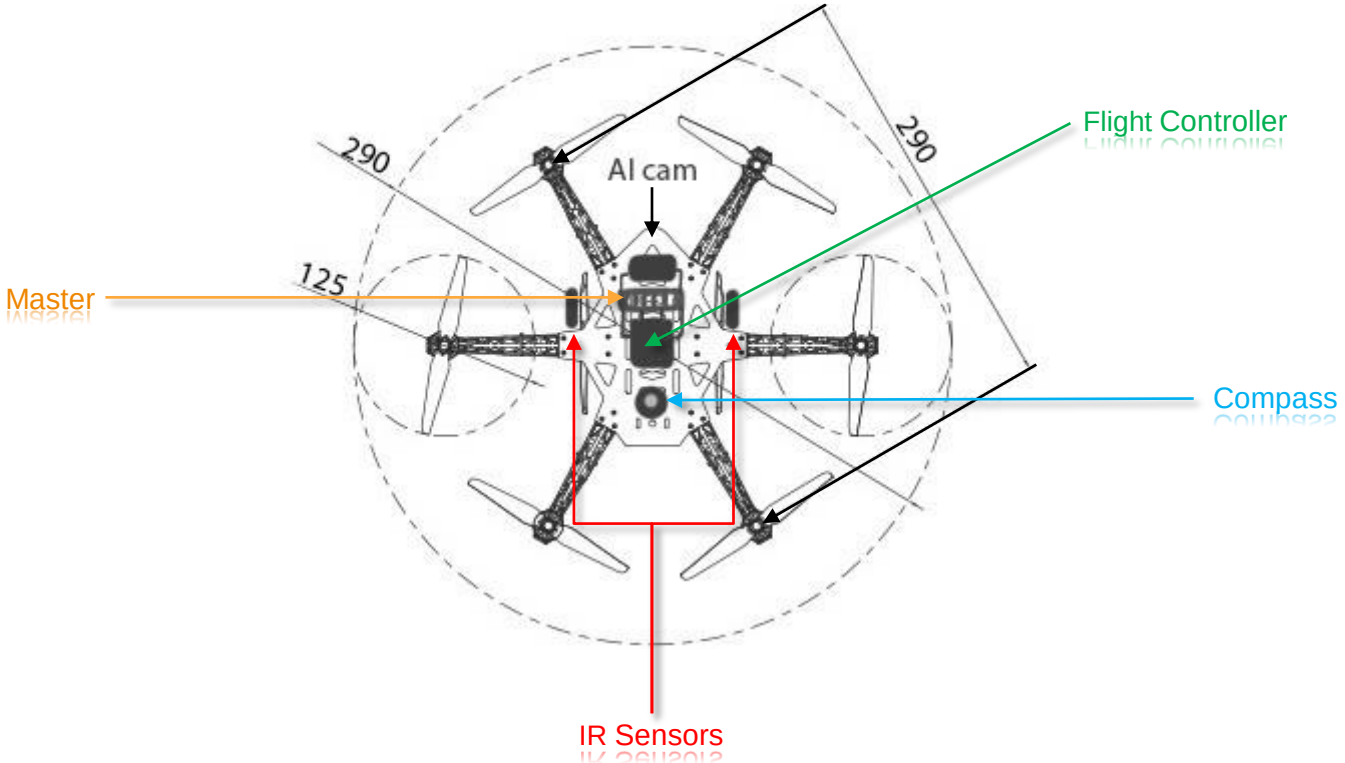
Q. *Are there any limitations compared to the requirements?*

+ No limitations wrt the requirements.

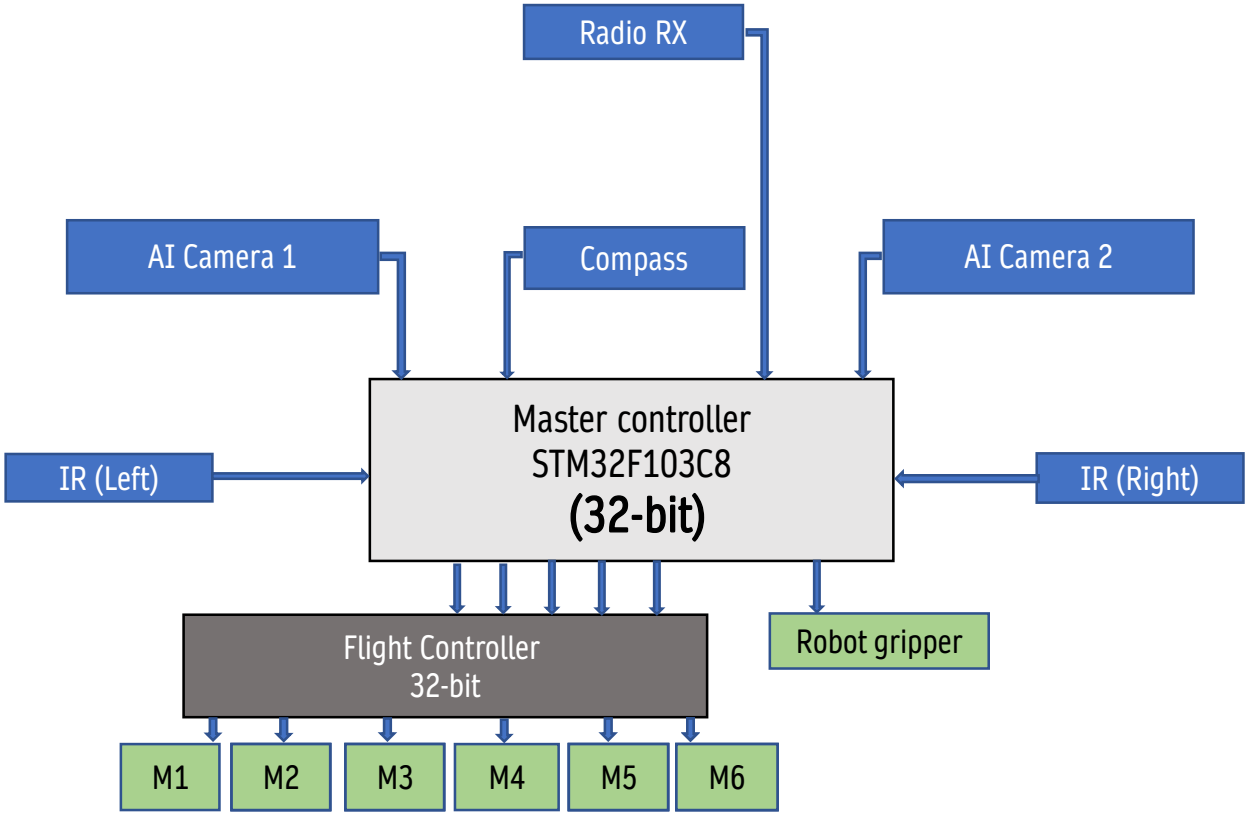
Q. *What can the robot not do?*

- Cannot lift payloads above 3kg
- Speed limited to approximately 0.5m/s while carrying payload (when automated)

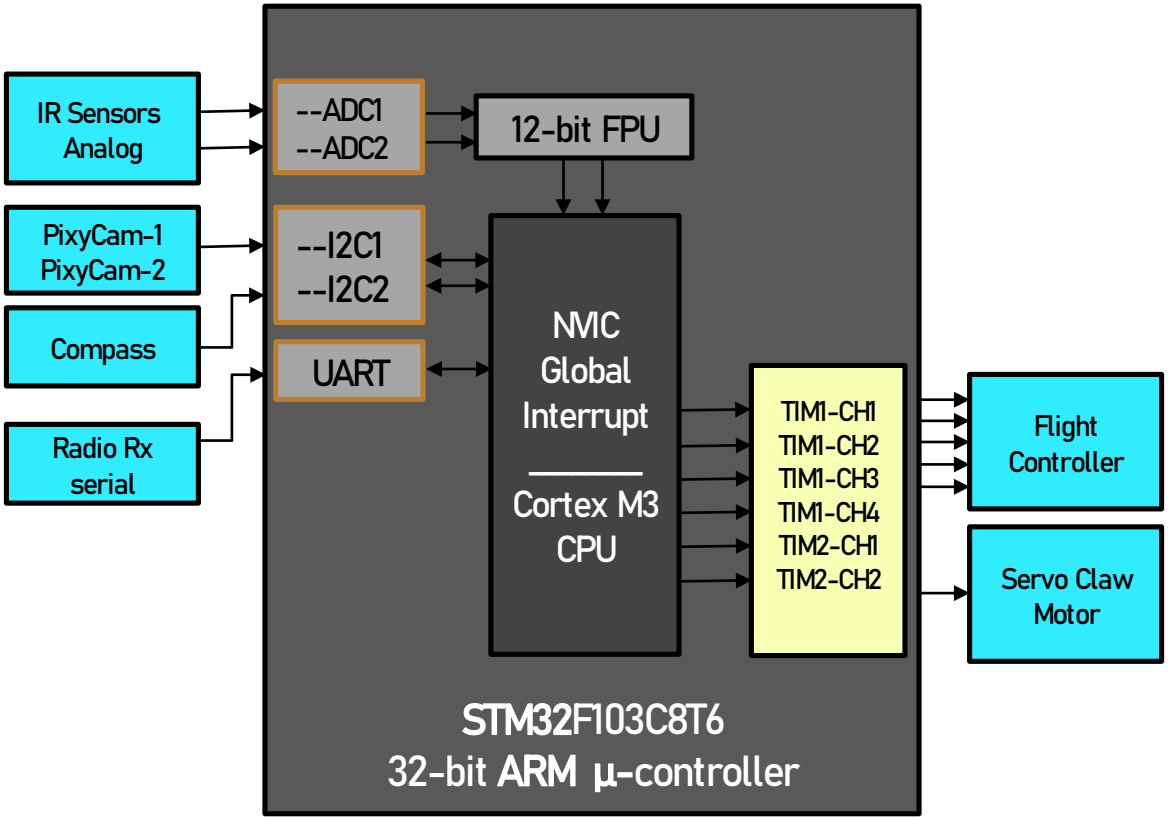
Robot Visualization -3D Diagram/Sketch



Architecture



Architecture(Core)



Brief on Programming Module

Q. What programming language will be used?

+ C language
+ Python language

Q. What all software modules will be built?

+ Mission training utility (Python & C)
+ Master firmware PID loops (3)
+ AI for going through gates
+ GUI for camera feed

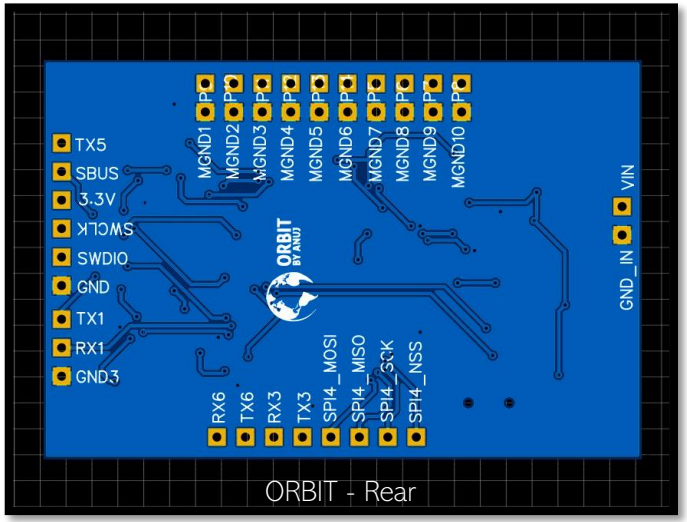
Execution Plan

With the idea on paper, we proceed in the following way:

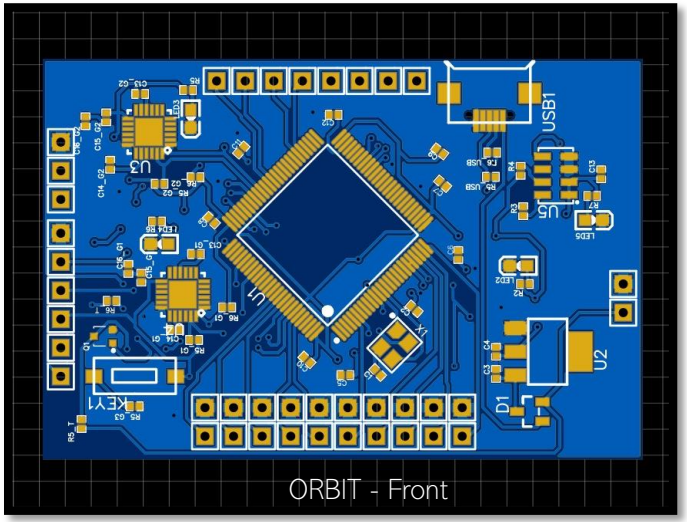
1. *Simulate the assembled hexacopter physics on pre-available platforms like VelociDrone.*
2. *Test separately the standalone modules used for desired functioning.*
3. *Calibrate the AI-Camera feedback for precise detection of objects, here 'gates'.*
4. *After successful simulation/testing, go on to fabricate/assemble the modules & the drone itself.*
5. *Calibrate the modules & sensors used for precise function through PID.*
6. *Test the prototype in different environmental scenarios.*
7. *Test the MVP (Minimal Viable Product) in a self-made arena, simulating the needs of the actual scenario.*

Extra: Our own Flight-controller

We take this opportunity to introduce teammate Pravesh's hard-work and expertise in the making of our own Flight-controller – ***"ORBIT"***



ORBIT - Rear



ORBIT - Front

(Repository: https://github.com/Elvez/STM32F746-Flight-Controller)

Orbit: Future Production Plan

(continued…)

- With Orbit, we aim to make the mass production of utility-drones cheaper and efficient in India (and maybe abroad).

- We wish to keep our project open-source for more widespread & creative development(s).

- The cost of a typical market-available *DJI Naza* flight controller ranges somewhere between ₹5000/- to ₹15000/- but our flight controller costs merely ₹30/- for PCB fabrication + ₹1000/- for all modules attached to it. Increasing module quality would result in a slight increase of the total cost.

- Orbit has its own firmware plus it can also support other common firmwares like ArduPilot, Betaflight, Cleanflight and iNav.

(Repository: https://github.com/Elvez/STM32F746-Flight-Controller)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