Hardware System Architecture Document

# Project ADSEN86 – Automated Drone Sentry

## List of Changes to Document:

**Draft Version: 1.0**

Initial version: 11/23/2024

Minimum Viable Product version: 1.0

### Project Name: Automated Drone Sentry

### Project ID: ADSEN86

## Introduction:

This document provides the overall hardware system architecture of the ADSEN86 project. ADSEN is Automatic Drone Sentry that has AI capabilities to follow its main user’s commands and perform sentry function. This architecture document provides a high level overview of the entire system and how the drone is architected to provide its service.

## Hardware Overview:

Figure 1

Raspberry Pi

Central Unit

Display

DC Brushless 1200KV motor

DC Brushless 1200KV motor

DC Brushless 1200KV motor

DC Brushless 1200KV motor

Li Po Battery 600-1000 mAh

4 Way Splitter

**-**

**+**

Camera

C S I

DSI

Connectivity Module (Bluetooth and Wi-Fi)

NPU

LED Signaling

Ultrasonic Sensors

**-**

**+**

The diagram in Figure 1 gives overall general hardware design of the automated sentry drone.

The drone will be powered by 4 brushless 3 phase DC motors that may have a KVA of 1000-1500. Each of these motors is controlled by an Electronic speed controller circuitry that drives the motor in 3 phase. Each of these will be controlled by a PWM input from the central Raspberry Pi unit through several GPIO inputs.

One of the Speed controllers will provide the +5V and Gnd input power to the Raspberry Pi. The individual speed controllers are powered by a 4 way splitter input that is connected to a high power LI-Po battery (800-1500mAh). The input voltage from the battery is around 25V and can use up to 35-40A x 4 of current in full drive. The battery is likely to be 3S-6S supply.

The charging infrastructure is included in the BOM as a list of items to buy. However the items are not included in the diagram. The charging infrastructure consists of a 3S-6S even charger. It also consists of charge safety bag to prevent fires.

The Raspberry Pi has a CSI connected Camera that can do HD video at 1080p. It should be able to handle 60FPS. It also has a DSI based display that can display the camera acquisition after rendering certain objects on it.

For Far visual Aid the sentry drone will consist of a LED array that can do Red and Green color LEDs. The LED will indicate different shapes. One way to control them is to use an I2C connection to program and LED controller. This can be decided based on design.

To support Neural Network and Machine learning operation and external USB3.0 connected NPU unit will be connected over the USB 3.0 port.

## Bill of Materials

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component** | **Component Brand** | **Website** | **Number of items** | **Cost** |
| DC Brushless Motors | EMAX Eco II 2302 Series – 1700KV | https://emaxmodel.com/collections/ecoii-series/products/emax-eco-ii-series-2306-1700kv-1900kv-2400kv-brushless-motor-for-rc-drone-fpv-racing | 4 | $78.25 |
| Rotors | DALPROP 5050 | https://www.expressdroneparts.com/products/dalprop-5050c | 4 | $12.00 |
| Electronic Speed Control | EMAX BLHELI\_S Bullet Series | https://emaxmodel.com/collections/bullet-series-esc-1/products/emax-blheli\_s-bullet-series-35a-3-6s-esc-6-3g-support-onshot42-multishot | 4 | $77.00 |
| Li-Po Battery 2500mAh | Tattu G-Tech 3500mAh 6S | <https://genstattu.com/tattu-g-tech-3500mah-6s-150c-lipo-battery-pack-with-xt90-s-plug/> | 1 | $96.99 |
| 4 Way splitter battery connector | XT90 Parallel Battery Connector Male/Female | https://www.aliexpress.us/item/3256807031998332.html?spm=a2g0o.productlist.main.3.10c84313ttWUJ6&aem\_p4p\_detail=202502041326306092003984330280014249810&algo\_pvid=7996c400-3eed-4dbb-8ea7-0c91f9c390cf&algo\_exp\_id=7996c400-3eed-4dbb-8ea7-0c91f9c390cf-1&pdp\_ext\_f=%7B%22order%22%3A%2262%22%2C%22eval%22%3A%221%22%7D&pdp\_npi=4%40dis%21USD%214.45%214.45%21%21%2132.38%2132.38%21%402101eab017387043904692059e889e%2112000039844543775%21sea%21US%210%21ABX&curPageLogUid=opLJzqC35JVZ&utparam-url=scene%3Asearch%7Cquery\_from%3A&search\_p4p\_id=202502041326306092003984330280014249810\_2&\_gl=1\*bdaxn2\*\_gcl\_au\*MTIwODU5OTA1Ny4xNzM4NzA0Mzky\*\_ga\*MTg2NTExOTMwNi4xNzM4NzA0Mzky\*\_ga\_VED1YSGNC7\*MTczODcwNDM5Mi4xLjAuMTczODcwNDM5Mi42MC4wLjA. | 3 | $13.35 |
| XT90 connectors | 12/10AWG XT90 Male Female Conversion Plug Connection Cable | https://www.aliexpress.us/item/3256808122157976.html?spm=a2g0o.productlist.main.31.10c84313ttWUJ6&algo\_pvid=7996c400-3eed-4dbb-8ea7-0c91f9c390cf&algo\_exp\_id=7996c400-3eed-4dbb-8ea7-0c91f9c390cf-15&pdp\_ext\_f=%7B%22order%22%3A%228%22%2C%22eval%22%3A%221%22%7D&pdp\_npi=4%40dis%21USD%216.27%210.99%21%21%2145.59%217.18%21%402101eab017387043904692059e889e%2112000044632892094%21sea%21US%210%21ABX&curPageLogUid=CAuyKYxhuLbm&utparam-url=scene%3Asearch%7Cquery\_from%3A&\_gl=1\*17nge18\*\_gcl\_au\*MTIwODU5OTA1Ny4xNzM4NzA0Mzky\*\_ga\*MTg2NTExOTMwNi4xNzM4NzA0Mzky\*\_ga\_VED1YSGNC7\*MTczODcwNDM5Mi4xLjAuMTczODcwNDM5Mi42MC4wLjA. | 4 | $4.00 |
| MIPI DSI display | **TBD** |  |  |  |
| Red LED | **TBD** |  |  |  |
| Green LED | **TBD** |  |  |  |
| Neural Processing Unit | Coral Ai | https://coral.ai/products/accelerator | 1 | $59.00 |
| Led board PCB | **TBD** |  |  |  |
| MIPI CSI Camera | Sony IMX92 camera sensor color for RaspPi | Already available | N/A | $0.00 |
| Drone Frame | **TBD** |  |  |  |
| Screws | **TBD** |  |  |  |
| Battery charger | Gens ace iMars D300 | https://genstattu.com/gens-ace-imars-d300-g-tech-channel-ac-dc-300w-700w-rc-battery-charger-us-white/ | 1 | $129.00 |
| UltraSonic Sensor | HC-SR04 Ultrasonic Sonar Distance Sensor | https://www.adafruit.com/product/3942 | 10 | $39.50 |
| ***Total BOM Cost*** |  |  |  | **$509.09** |