Versatile swarm robotics platform for distributed algorithms developer and interaction

ABSTRACT

This paper introduces a versatile swarm robotics platform for distributed algorithm test and visualization, also an extendable open-source open-hardware platform for developing tabletop tangible swarm interfaces.

CCS CONCEPTS

• **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability.

KEYWORDS

datasets, neural networks, gaze detection, text tagging

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1 INTRODUCTION

2 EXPLORER VERSION

For those researcher who want to develop distributed algorithms or tabletop swarm robots of their own, we provide an open-source open-hardware platform. It supports 4 kinds of different communication prototols, and integrate easy-to-use programmer and debug connector. To drive stepper motor and DC motor, we have Powerstep01 on board with neccessary coponents. To extend its function, we provide universal interface which can communicate with other develop board such as Nvidia Jetson NANO.

All functionalities on board is shown below:

- Mega2560-16AU main MCU
- ATMega16U2 USB-UART
- USB Type C port
- PowerStep stepper motor and DC motor drive
- 9 x WS2812B RGB-LED full-color light display
- Downward looking infrared camera with dot paper for positioning
- XBee3, the main Mesh network communication
- Espressif ESP32, provides WiFi 5, Bluetooth, BLE communication
- CP2102. We can burn programs through USB Type C port
- External battery power supply
- USB port power supply
- Buck DC-DC and impulse back pressure overvoltage and overcurrent protection
- Programmable pins for testing
- Support UART, I2C, SPI communication protocol expansion interface

The PCB schematic is shown in Fig 1, and its 3D model in Fig 3. After SMT, the PCB is shown in Fig 4.

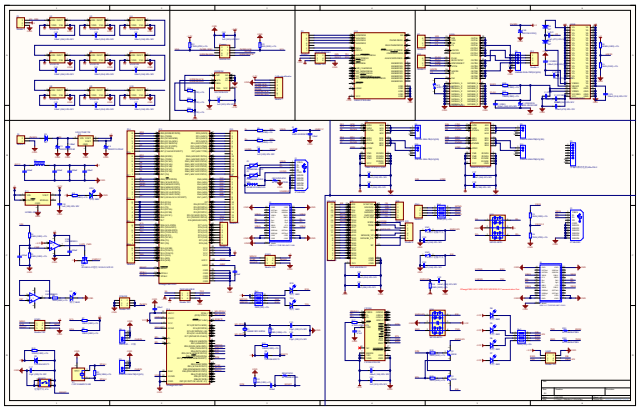

Figure 1: Explorer version PCB schematic

layout is shown in Fig **??**,

3 FUTURE RTLS WITH BLUETOOTH 5.1

Real-time location systems (RTLS) are used to track and identify the location of objects in real time using "Nodes" or "tags" attached to, or embedded in, the objects tracked, and "Readers" that receive and process the wireless signals from these tags to determine their locations.[1]

The Bluetooth SIG presented Bluetooth 5.1 in January 2019. With Angle of Arrival (AoA) and Angle of Departure (AoD) which are used for location and tracking of devices, we can simply use BLE 5.1 as both communication and localization methods.

ACKNOWLEDGMENTS

To my girlfriend Yihan Jia, for help me during the research.

REFERENCES

[1] HW costs Tags-low and Medium Medium High High. 2009. Real Time Location Systems. (2009).

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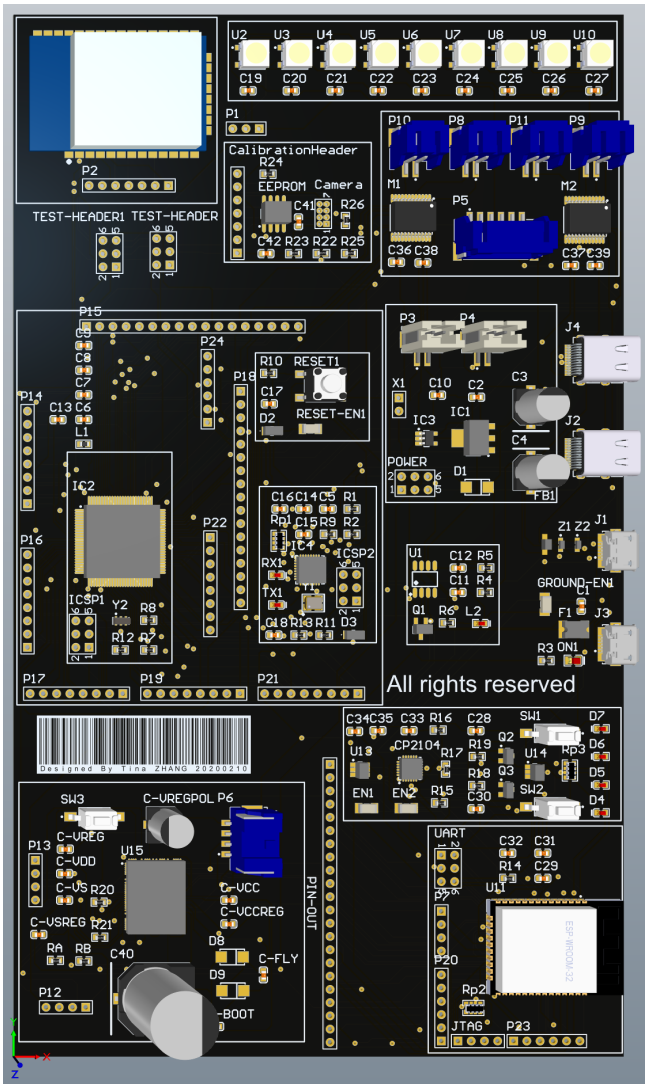

Figure 3: 3D model

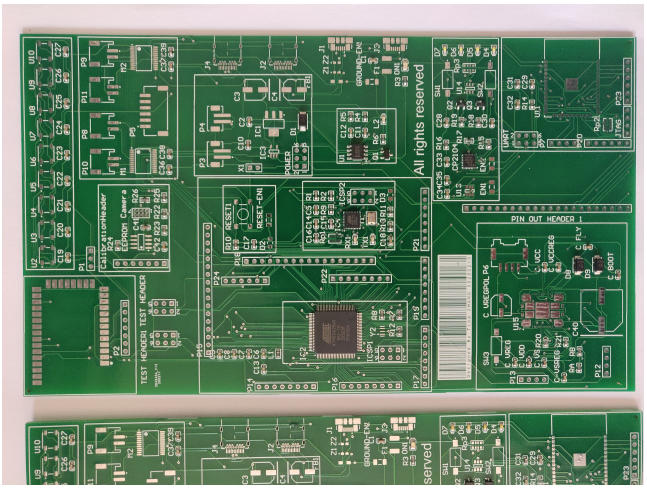

Figure 4: PCB after SMT