الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يونيورسيتي إسلام انتارابغسا ملايسيا
Garden of Knowledge and Virtue

MECHATRONICS SYSTEM INTEGRATION

SECTION 2

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LECTURER:

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LAB REPORT WEEK 6:

Smart Surveillance System Using Pixy Cam

GROUP 14

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TABLE OF CONTENTS

Introduction	**3**
Material and Equipments	**3**
Experiment Setup	**4**
Methodology	**4**
Results	**5**
Discussion	**5**
Conclusion	**6**
Recommendation	**6**
Reference	**7**
Student Declaration Form	**8**

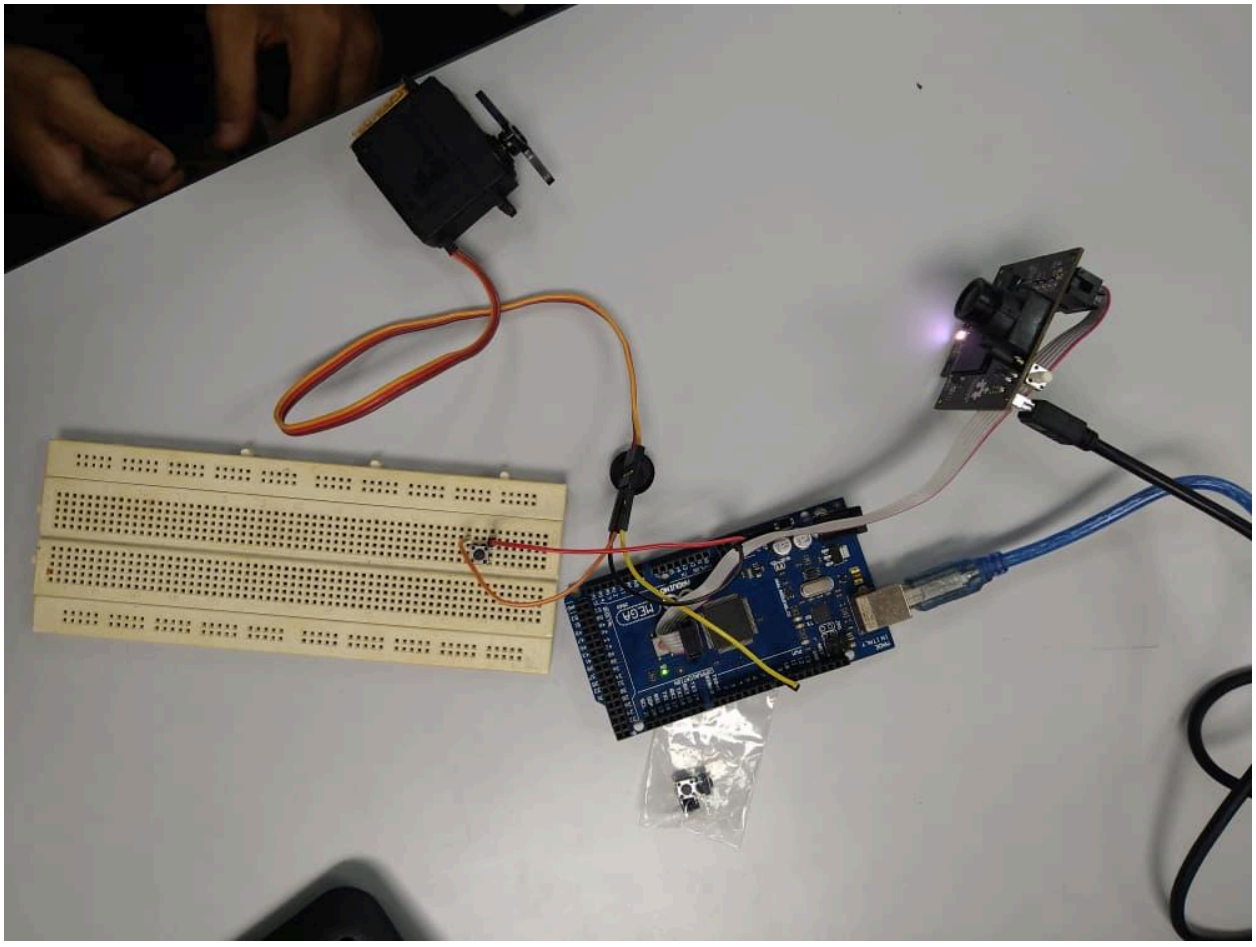
INTRODUCTION

The experiment focuses on developing a smart surveillance system integrating IoT and actuator systems, originally using the ESP32-CAM module for live video streaming and servo motor-based horizontal panning to simulate moon tracking. The objective was to interface and stream live video, control a servo motor for camera panning, and build a basic surveillance prototype demonstrating wireless data transmission and control. Due to hardware availability, the Pixy Cam was used as a substitute for the ESP32-CAM, leveraging its vision sensor capabilities to compensate for the original camera module functions.

MATERIALS AND EQUIPMENTS

COMPONENT	QUANTITY
PIXY CAM	1
UBS-TO-SERIAL ADAPTER	1
SG90/MG90S SERVO MOTOR	1
PUSHBUTTON	1
5V POWER SUPPLY	1
JUMPER WIRES	SEVERALS
BREADBOARD	1
MOUNTING BRACKET/SERVO BASE	1

EXPERIMENTAL SETUP



METHODOLOGY

1. Upload the code using FTDI or CH340 USB to TTL Serial Cable

2. Open Serial Monitor at 115200 baud

3. Find the IP address printed by the ESP32-CAM

4. Enter the IP in a browser on the same Wi-Fi network

5. Observe the live video feed

6. Watch the servo panning back and forth

7. Press the button to simulate moΘon-based control

RESULT

Code and videos will be provided on our github link.

DISCUSSION

This experiment demonstrated the integration of the Pixy2 camera with a servo motor to form a simple surveillance system. The Pixy2 detects a trained color signature and sends the X-coordinate data to the microcontroller, which used PWM to rotate the servo left or right. This then showed how real-time object position data could be converted into mechanical panning motion.

As the tracked object moved across the camera's field of view, the servo adjusted its angle accordingly to follow the change in position. The response depended on how far the object was from the centre. Minor jitter appeared when the object was near the midpoint; with very small error values, this was expected.

A push button was included to enable the manual override. The servo panned only when the button was pressed, showing how a simple digital input could be used to control when the system operates.

Some issues were noticed in the lab: change in light affected readings from Pixy2, and sometimes it required recalibration for the same object to be consistently detected. Adjustment in servo range was also made to avoid the motor reaching its limits. Despite this, the system worked as it was supposed to when its components were tuned.

Overall, the experiment demonstrated how sensing (Pixy2), processing (microcontroller), and actuation (servo) are combined for a simple tracking mechanism, which could be suitable for small-scale surveillance applications.

CONCLUSION

This experiment developed a simple surveillance system that utilized the Pixy2 camera, a microcontroller, and a servo motor. Object position information obtained from the Pixy2 was used to control a servo for horizontal panning. This was integrated with a push button that enabled manual actuation. This experimental setup explained how vision sensing, digital input control, and movement of actuators can be encapsulated into one mechatronic system. Though several problems were faced, such as sensitivity to lighting and calibration issues with the servo, proper adjustment of these components allowed the system to track a coloured object. This experiment provided a practical insight into how basic tracking mechanisms are built and how each subsystem contributed to the operation of the entire system.

RECOMMENDATION

1. Using a camera of better quality for clearer images

2.Faulty hardware should be replaced as soon as possible

REFERENCES

[1] https://randomnerdtutorials.com/program-upload-code-esp32-cam/ How to Program / Upload Code to ESP32-CAM AI-Thinker (Arduino IDE)

[2] https://my.cytron.io/p-ch340-usb-to-Σl-serial-cable CH340 USB to TTL Serial Cable

[3]https://arduino-er.blogspot.com/2020/09/program-esp32-cam-using-Ōdi-adapter.html Program ESP32-CAM using FTDI adapter

[4] https://www.youtube.com/watch?v=D3MPBPGT3cw Program ESP32-CAM using FTDI adapter

[5] https://core-electronics.com.au/guides/esp32-cam-set-up/ Use a ESP32-CAM Module to Stream HD Video Over Local Network

STUDENT'S DECLARATION

Certificate of Originality and Authenticity

This is to certify that we are responsible for the work submitted in this report, that the original work is our own except as specified in the references and acknowledgement, and that the original work contained herein have not been untaken or done by unspecified sources or persons.

We hereby certify that this report has not been done by only one individual and all of us have contributed to the report. The length of contribution to the reports by each individual is noted within this certificate.

We also hereby certify that we have read and understand the content of the total report and no further improvement on the reports is needed from any of the individual's contributors to the report.

We therefore, agreed unanimously that this report shall be submitted for marking and this final printed report has been verified by us.

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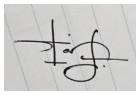
Signature: 

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