香港中文大學
The Chinese University of Hong Kong

CENG2400 Embedded System Design

Final Project:
Motion Control Lazer Turret

ZHANG Zhirui

zhirui.zhang@link.cuhk.edu.hk

Outline

- Module 1: Project Objective and Plagiarism Penalty

- Module 2: Specification and Assessment Rubric

- Module 3: Implementation Suggestions

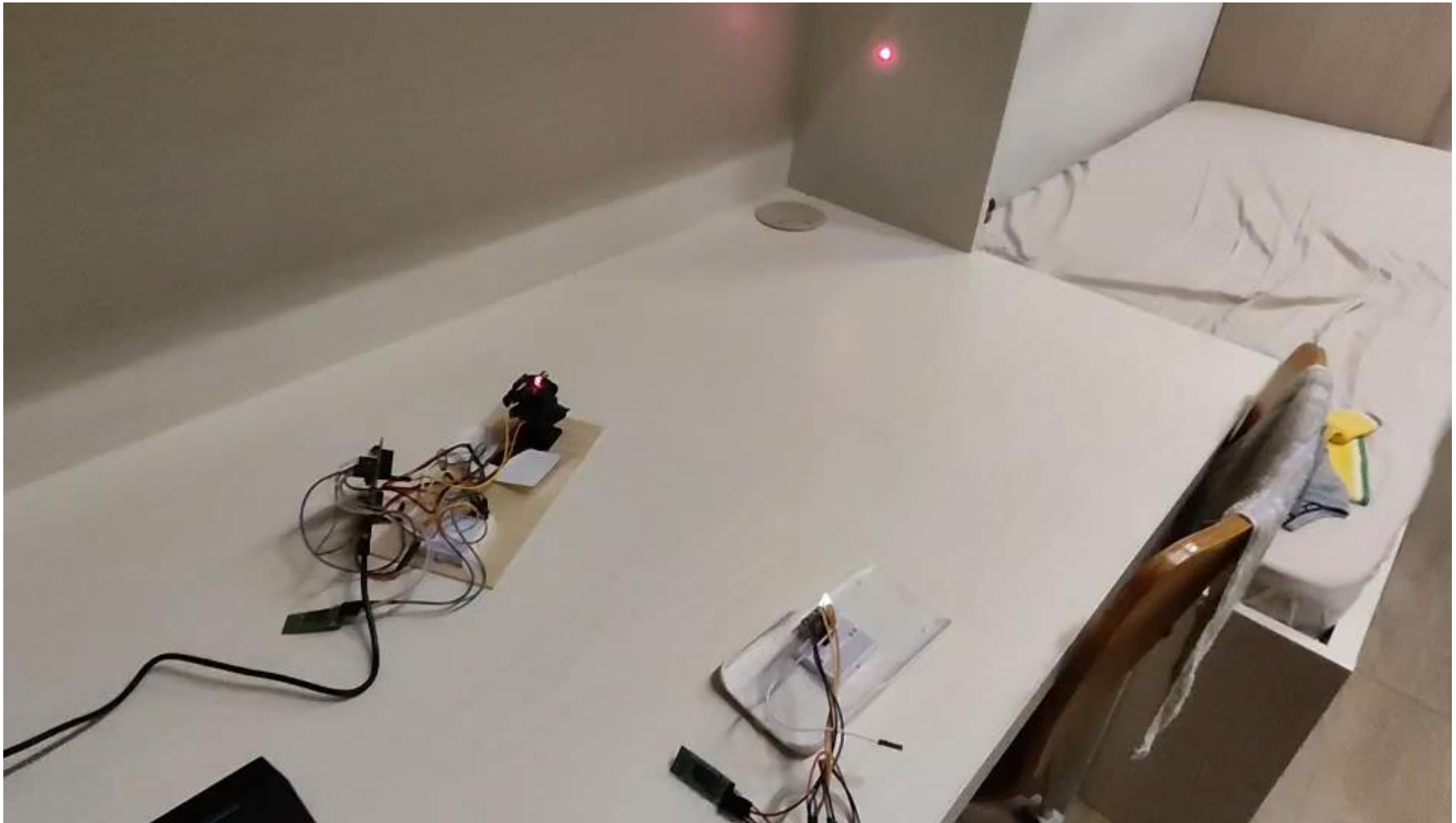- Module 4: Demo Code Illustration

Module 1

Project Objective and Plagiarize Penalty

Project Objective and Plagiarize Penalty

- Students are required to implement a "Motion control Laser turret" using Tiva C LaunchPad.

Project Objective and Plagiarize Penalty

- Students are asked to work in a team of 2-3 for this project.

- Students need to attend the demo day in groups.

- The project is graded according to various stages and the performance in the demo day.

- Students need to upload the code of the entire project for demo before 11:59 pm on the night before the demo day.

- Students need to finish one report on how you completed this project.

• The uploaded code will be checked by Veriguide

The Chinese University of Hong Kong places very high importance on honesty in academic work submitted by students, and adopts a policy of *zero tolerance* on academic dishonesty. While "academic dishonesty" is the overall name, there are several sub-categories as follows:

(i)   Plagiarism

(ii)   Undeclared multiple submissions

(iii)   Employing or using services provided by a third party to undertake ones' submitted work, or providing services as a third party

(iv)   Distribution/ Sharing/ Copying of teaching materials without the consent of the course teachers to gain unfair academic advantage in the courses

(v)   Violating rules 15 or 16 of the University's Examination Rules (Annex 1) or rule 9 or 10 of the University's Online Examination Rules (Annex 2)

(vi)   Cheating in tests and examinations (including violation of rules 17 or 18 of the University's Examination Rules or rule 11, 12, 13, 14 or 16 of the University's Online Examination Rules)

(vii)   Impersonation fraud in tests and examinations (including violation of rule 19 of the University's Examination Rules or rule 15 of the University's Online Examination Rules)

(viii) All other acts of academic dishonesty

Any related offence will lead to disciplinary action including termination of studies at the University.

Everyone should make himself/herself familiar with the content of this website and thereby help avoid any practice that would not be acceptable.

香港中文大學對學生作業有嚴格的學術誠信要求，違反學術誠信的個案，一律以零容忍政策處理。「違反學術誠信」是一個統稱，包括以下類別：

(i)   抄襲

(ii)   未有聲明重覆使用作業

(iii)   聘用或使用第三者服務以助其完成提交的作業，或作為第三者提供服務

(iv)   未經科目老師事先同意下分發/分享/複製教學材料以在該科目獲得不公平的學術優勢

(v)   違反大學考試試場規則（附件一）第十五或第十六條或違反大學網上考試規則（附件二）第九或第十條

(vi)   測驗及考試作弊（包括違反大學考試試場規則第十七或第十八條或違反大學網上考試規則第十一、第十二、第十三、第十四或第十六條）

(vii)   在測驗及考試中冒充他人的作弊行為（包括違反大學考試試場規則第十九條或違反大學網上考試規則第十五條）

(viii) 所有其他違反學術誠信行為

違反有關規定的學生予以懲處，嚴重者包括開除學籍。

同學不能掉以輕心，應熟習本網頁內容，以免犯錯。

Module 2

Specification and Assessment Rubric

Specification

- Students are required to implement a "Motion control Laser turret" using Tiva C LaunchPad.

- The user can change the target of the laser turret by controlling the movement of MPU6050.

- The MPU6050 and laser turret are connected to two Tiva boards respectively.

- The information transmission between them is completed via Bluetooth module HC-05.

- There is a laser transmitter on the top of the laser turret, and the laser is always on.

Rubic

- 30% — Report
- 30% — Completed Project
- 40% — Demo day

Demo day

- Upload the entire project
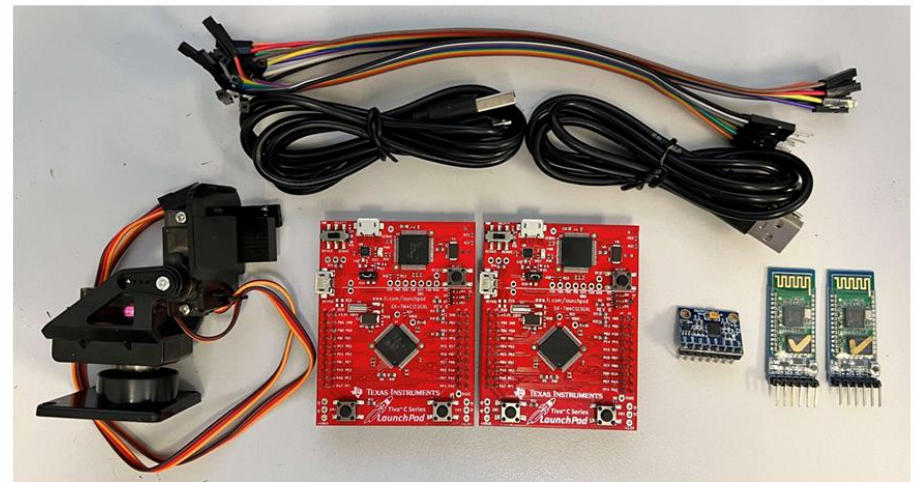

- Start the timer (1 minute (tentative))
- Power on the board
- Start hitting the target
- Time up/No Targets Left (100 marks!)
- Got one score

- Finish the report based on code (update available)

Hardware

- For each group:

  - Two Tiva C launchPad

  - One MUP6050

  - Two Bluetooth devices

  - One servo head (contains two MG90s)

  - Several DuPont wires

  - Two cables

  - Two Breadboards

  - One Laser Transmitter

Module 3

Implementation Suggestions
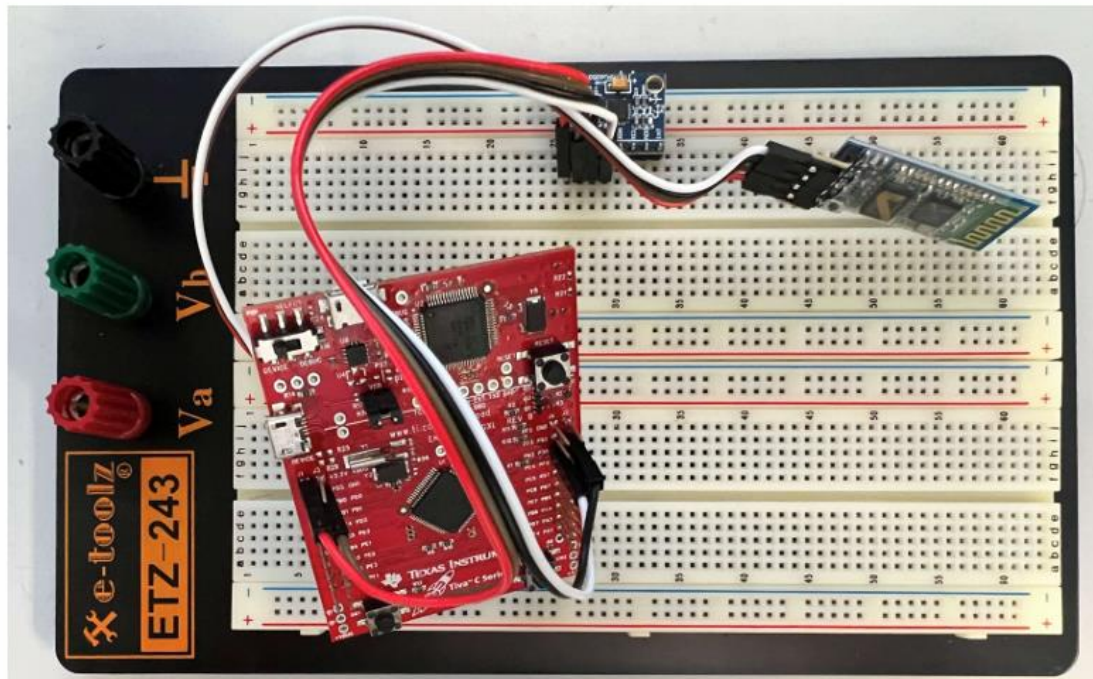
Implementation Suggestions

- Data Transmission
- Data Transformation

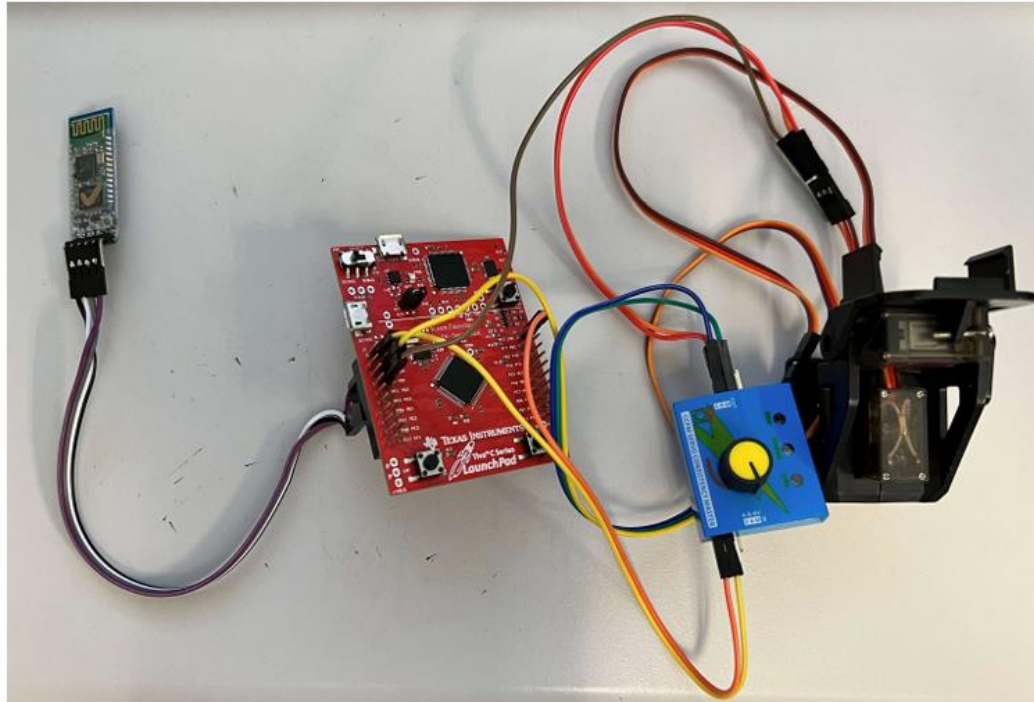# Hardware Assembly - Master

- Assemble the Controller part
    1. Collect Tiva launchpad, Bluetooth, and MPU6050
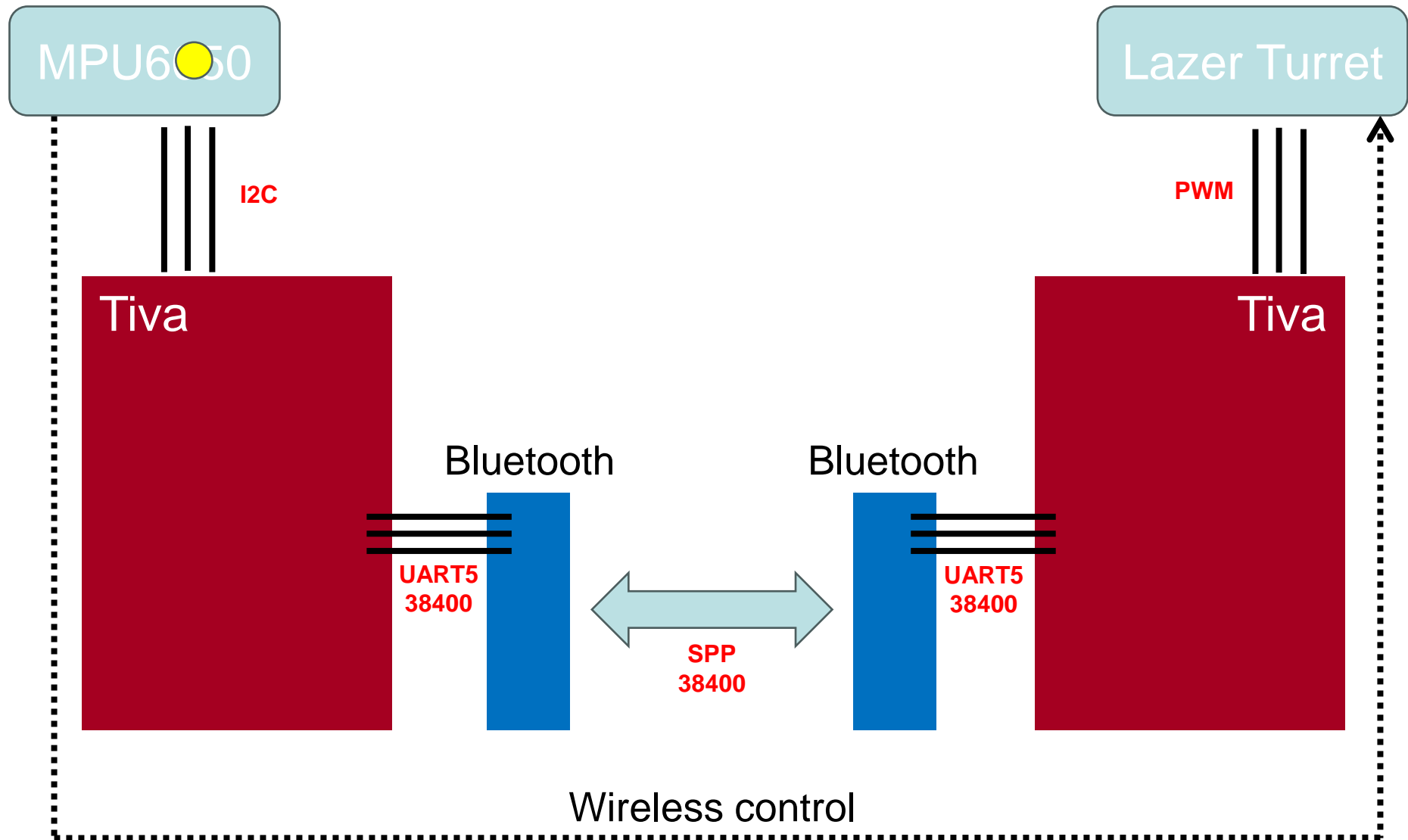   2. Connect them on a Breadboard with Dupont wires

Hardware Assembly - Slave

- Assemble the Executor part
    1. Collect Tiva launchpad, Bluetooth, and Servo head
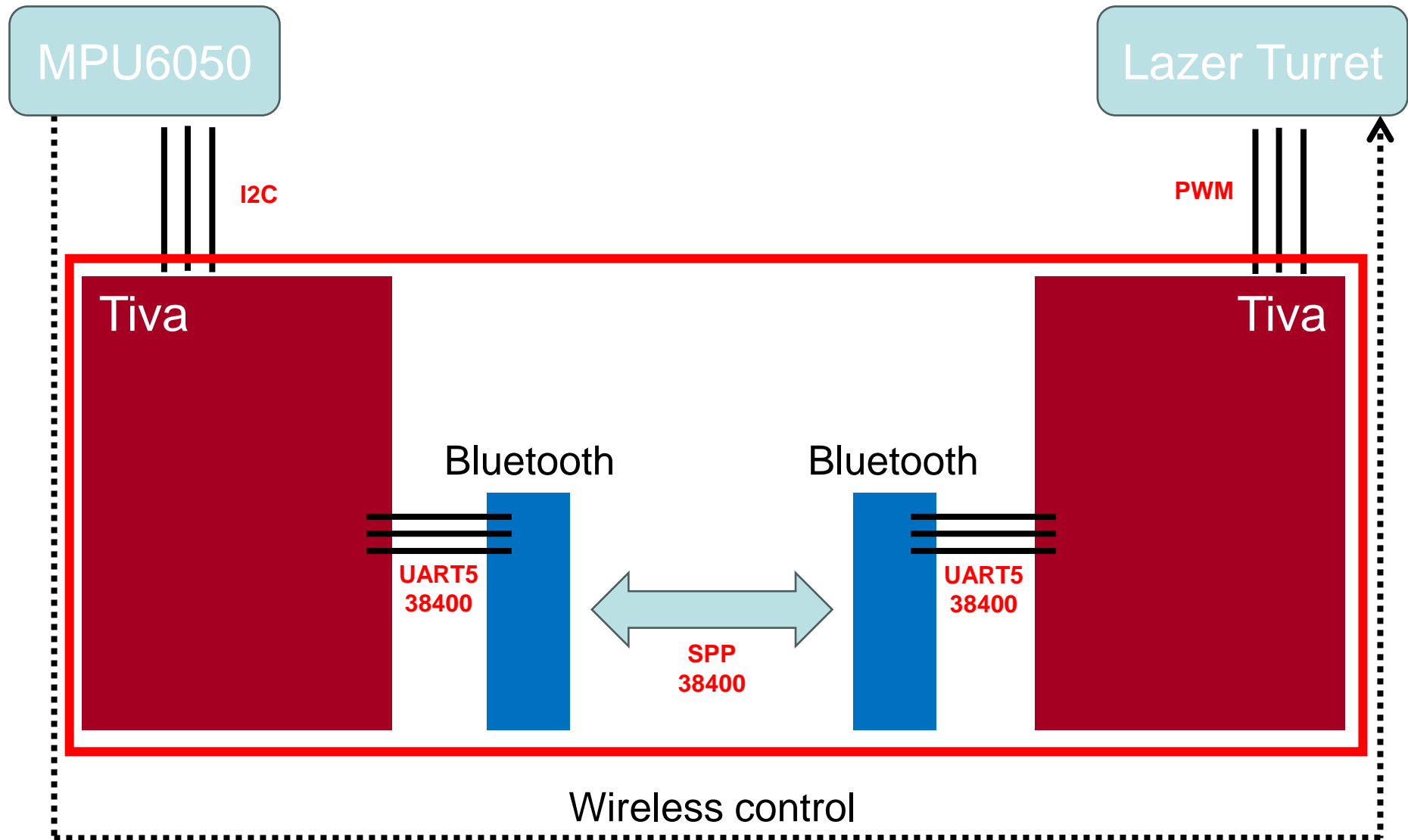   2. Connect them on a Breadboard with Dupont wires

How it works - Data Transmission

MPU6050 — I2C — Tiva

Tiva — Bluetooth — UART5 38400

SPP 38400

Bluetooth — UART5 38400 — Tiva

Tiva — PWM — Lazer Turret

Wireless control

How it works - Data Transmission

MPU6050

Lazer Turret

I2C

PWM

Tiva

Tiva

Bluetooth

Bluetooth

UART5
38400

UART5
38400

SPP
38400

Wireless control

How it works - Data Transmission

MPU6050

Lazer Turret

I2C

PWM

Wireless control
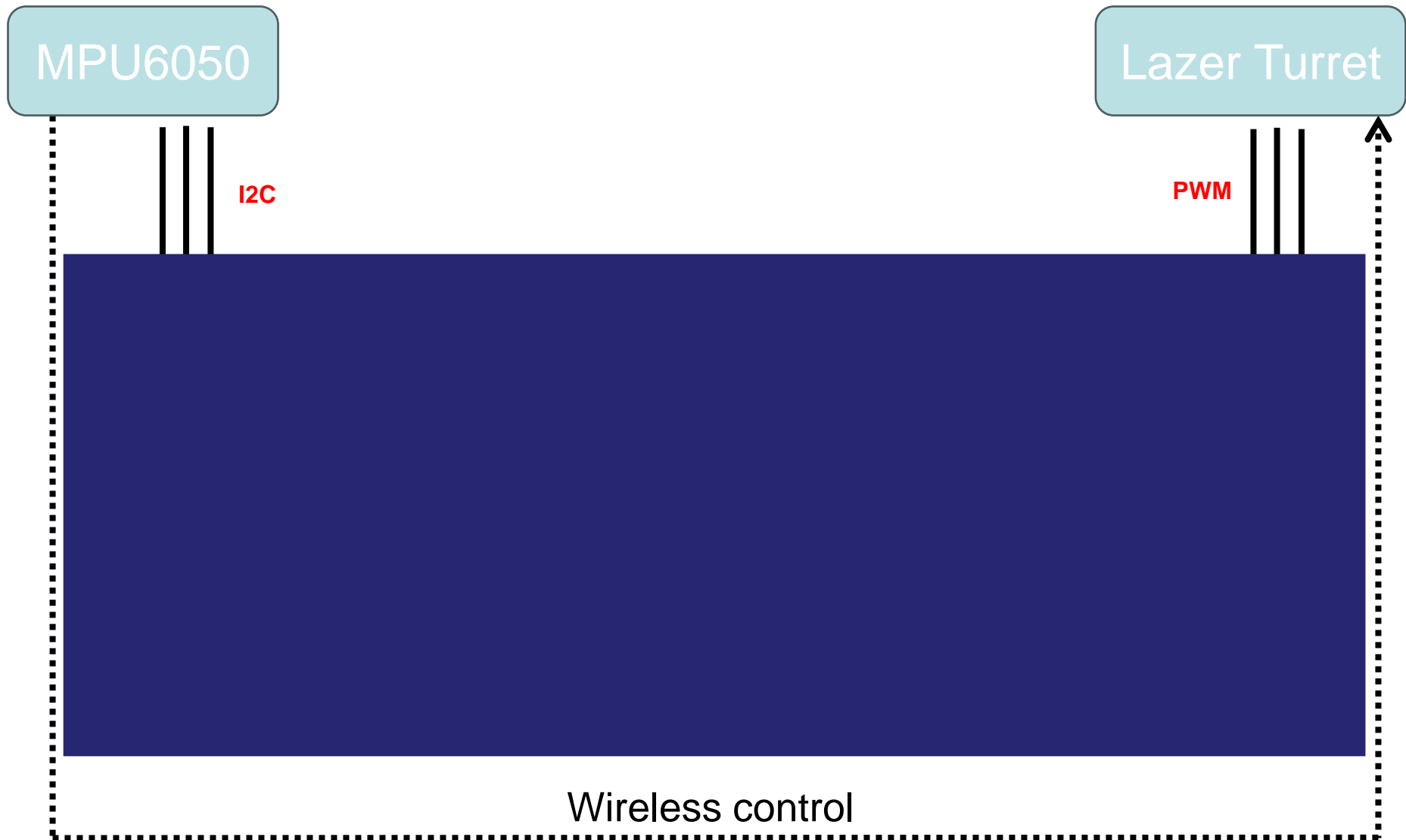
How it works - Data Transformation

MPU6050 | Angular Speed & Acceleration | ≠ | Angle Displacement | Lazer Turret

Distance (s) — differentiate → **Velocity (v)** — differentiate → **Acceleration (a)**

Velocity (v) — integrate → **Distance (s)**

Acceleration (a) — integrate → **Velocity (v)**
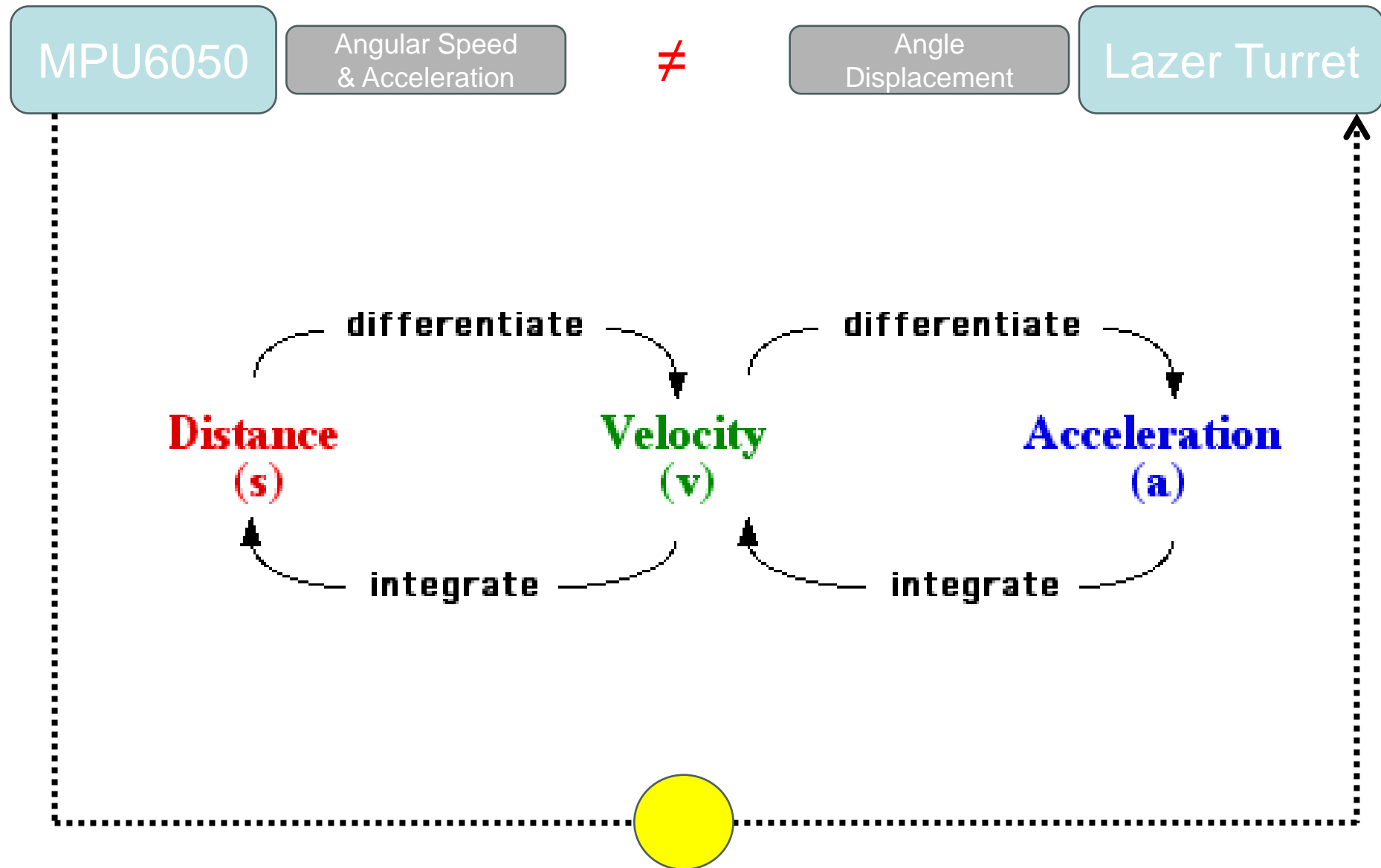
Module 4

Demo Code Illustration

Thanks for listening!

Q & A