MONITORING OF JUMPS WITH AN AD-HOC INERTIAL SYSTEM

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INTRODUCTION AND MOTIVATION

- Jumps can be an indicator of **physical ability** and the **state of fatigue.**
- The main goals are to obtain an **accurate** measurement of jump performance using a **low-cost** and fully **portable** system.
- The design is based on an **inertial system**, where the data are collected and processed using an ad-hoc developed **application** running on a **smartphone**.

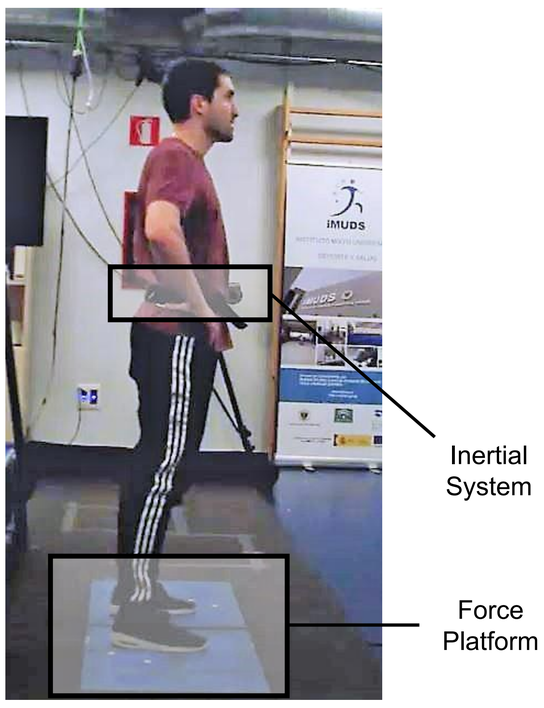
MATERIAL AND METHODS

Facilities, equipment and methods

- Systems used for measurements:

  - Gold standard: Force platform Kistler 9260AA6.

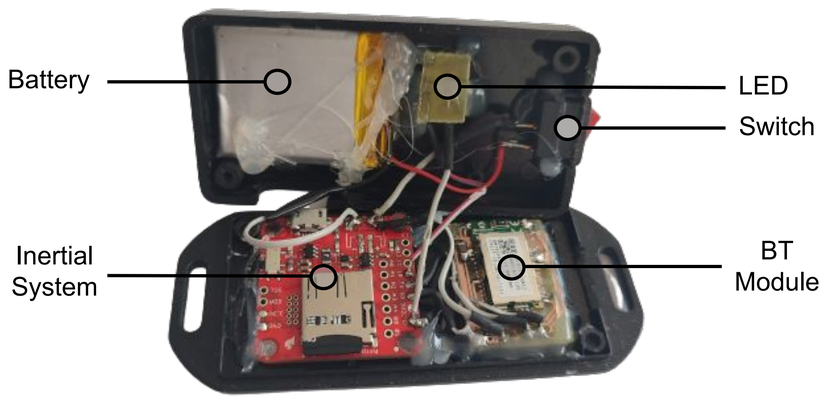
  - Inertial system used in the design: **9DoF Razor IMU M0** (with 3-axis accelerometer).
- The study was carried out within the **IMUDs** facilities (University of Granada).
- The studied jump technique is the **Counter Movement Jump (CMJ).**



System Location

System features

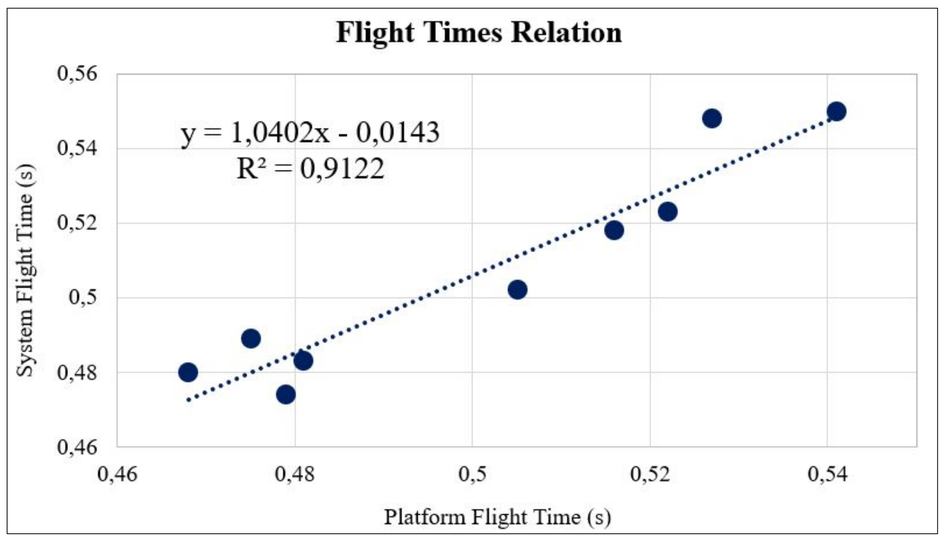
- Registers the acceleration in the axis of interest within the range of ±**16 g** at a sampling rate of **200 Hz**.
- Capable of **Bluetooth communication** through the low energy BT protocol (BM78 module integrated).
- Lithium-polymer battery of **450 mAh** that provide power autonomy **higher than 3 hours**.
- **SD card** that allows data storage.
- Total weight of **47 g.**
- Data processing in a **smartphone application.**

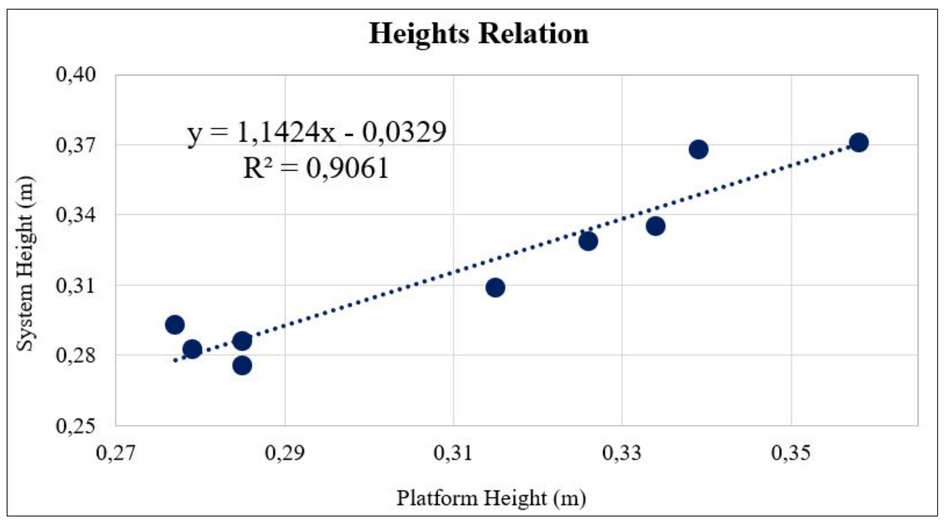


Components of the system

RESULTS AND CONCLUSIONS

Results





- The **level of agreement** of the data has been checked studying the linearity of the platform data against the system data.
- The perfect result would be a straight line with slope 1 and origin at 0 (with an R^2 coefficient of 1 that indicates perfect adjustment of data), and the obtained are:

  - Flight Time: 1.04x - 0.01 (R^2 = 0.912)

  - Height: 1.14x - 0.03 (R^2 = 0.906)
- **Error** between the measurements of the gold standard with respect to those of the system, taking the data in **absolute value**, is **1,53%** for the **flight time** and **3,63%** for the **height reached**.
- **Repeatability** has also been proven, getting a **maximum difference of 4% and 8%** of each of the data relative to the mean of each trial for the flight time and height respectively.

Conclusions

- The proposed system presents **promising capabilities**, and it is expected to be applied in **field trials.**
- Work is **currently** conducting a **validation** trial with a **larger number of subjects.**

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