# Development of Motion Tracking Device to Determine Swing Profile of a Golf Player

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**Abstract.** Understanding the biomechanics during a golf swing is crucial. One way to understand it is by looking at the swing profile. Most of the time, the swing profile is assessed qualitatively by golfers. However, the qualitative evaluation is very subjective, and golfers have no quantitative data which they might refer to for optimisation. The quantitative assessment, meanwhile, is expensive, has limited access, and focuses on a single-point measurement. This research aims to create a motion-tracking device that captures a golfer's swing profile. The device comprises MPU6050, FireBeetle ESP32 microcontroller and a 3.7V Li-Po battery. The commercial MMS sensor was the reference, and the MPU6050 was set to the nearest equivalent specifications. Based on the findings, the device matches the performance of the MMS, considering the bandwidth difference and the position of the MPU6050. Moreover, multiple devices can be used in which ESP Now communication was embedded between the FireBeetle ESP32 boards to capture the swing profile of different body parts. The device offers golfers quantitative feedback on their golf swing, which can be analysed for improvement.

**Keywords:** Golf swing profile, ESP32, ESP-Now, MPU6050, Biomechanics of golf swing, motion tracking device.

## 1 Introduction

Golf is a sport that needs accuracy and technique. It is a complicated process in which various body elements move in straight lines and rotate while swinging a golf club [1]. It is critical to understand biomechanics throughout the golf swing. This includes examining golfers' movements and muscle activation patterns as they swing the club, as well as the internal and external forces at work [2-3]. Understanding these aspects allows golfers and coaches to discover areas for improvement to assist golfers in optimizing their swing and shot-making abilities [4-5].

Traditionally, a golfer's biomechanics are assessed qualitatively. It entails breaking down the swing into discrete phases (preparation, execution, and follow-through) and