

## **ABSTRACT**

*Sack racing is one of the traditional races with the fastest running players using sacks until the final goal becomes the winner. In today's modern era, previous cultures and traditions have been forgotten by children with digital-based modern games. In sack racing game is the activity of playing by jumping to play the game. In the development of digital-based sack racing games using unity application that will be designed in it.*

*In this study the authors assembled a belt prototype tool that will be attached to the user's waist when playing motion capture-based games using the Mahony Filter method designed on the MPU9250 and ESP32 IMU sensors that will be implemented in sack racing games using Unity3D.*

*Based on the test results, the simulation of the IMU sensor-based belt prototype produced roll, pitch, and yaw data with manual count proof obtained the pitch axis had the smallest error average value of  $0.3^\circ$ . The axis used at the time of jumping is the pitch axis with a standard average deviation of the upper limit of  $17.385^\circ$ . The data obtained is sent from Arduino local to Antares web server with an average delay of 2.99 seconds and delay of receiving data for one second. The results showed that the overall performance of the belt prototype system for motion capture compatibility with the player on Unity3D obtained 100% motion fit.*

*Keywords: Sack Race, Motion Capture, Unity3D, Mahony Filter, MPU9250, and ESP32*