IMPROVEMENT OF SUPPORT INSTRUMENT FOR PETANQUE

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BACHELOR OF ELECTRONIC ENGINEERING TECHNOLOGY (Telecommunication) WITH HONOURS

2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Electrical and Electronic Engineering Technology

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A report submitted
in fulfillment of the requirements for the degree of
Bachelor of Electronic Engineering Technology (Telecommunication) with Honours

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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This report is submitted to the Faculty of Electrical And Electronic Engineering of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

Signature : .....

Supervisor Name : Ts. Khairul Anuar Bin A.Rahman

Date : 13/02/2021

.....

DEDICATION

Alhamdulillah, Praise to the Almighty Allah S.W.T

This project is especially dedicated to who were always trust and support:

My parents,

My supervisor,

My beloved Family,

My lecturers

and my friends.

Sincerely from my heart, thank you for your love, care, support and helping.

I appreciated it

ABSTRACT

This project aims to create an improvement of support instrument for petanque's athlete performance. This study emphasis on measure the accuracy and precision the movement, acceleration, force and angle of athlete's body, arm and leg. This study will begin with an overview of the background of study, problem statement, objective and project scope of the project includes with the outline project. For the literature review section, the research approach the suitable software and hardware that are used in this project. The methodology in this project explain how the support instrument work for athlete. The measurement of athlete performance will be analysis and discuss in this project. The right technique and method for athlete used during training will be determine. The approach towards future recommendations is also discussed.

ABSTRAK

Projek ini bertujuan untuk menghasilkan peralatan sokongan untuk meningkatkan prestasi atlet petanque. Kajian ini mengfokuskan untuk mengukur ketepatan dan kejituan pergerakan, pecutan, daya dan sudut putaran badan, lengan dan kaki atlet. Kajian ini akan dimulakan dengan gambaran keseluruhan latar belakang kajian, pernyataan masalah, objektif dan skop projek termasuk dengan garis besar projek. Untuk bahagian tinjauan literatur, penyelidikan mengambil kira kesesuai perisian dan perkakasan yang akan digunakan dalam projek ini. Metodologi dalam projek ini menjelaskan bagaimana peralatan sokongan berfungsi kepada atlet. Pengukuran prestasi atlet akan dianalisis dan dibincangkan dalam projek ini. Teknik dan kaedah yang tepat untuk atlet yang digunakan semasa latihan akan ditentukan. Pendekatan untuk cadangan masa depan juga dibincangkan.

ACKNOWLEDGEMENTS

In the Name of Allah, the Most Gracious, the Most Merciful

Alhamdulillah, thank you Allah's gracious and merciful for letting me with a great health and ability to finish my final year project ended successfully.

I would like to express my gratitude towards to all who gave me possibility to complete this paper. I would extend my deepest appreciation to my beloved parent that I treasured the most, Kamaruzaman Bin Hasssan and Zaidah Binti Mat Isa that giving me the endless supports throughout this entire project.

Then, I deeply indebted to my supervisors En. Khairul Anuar bin A Rahman for his guidance and encouragement for me towards this project. Last but not least, to my friends who have always been helped and motivated me during complete this paper. This paper would not be possible without all of them.

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D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
1	-	Length
N	-	Rotational velocity
V	-	Velocity
w	-	Angular velocity

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CHAPTER 1

INTRODUCTION

1.1 Background

Generally, the factors inducing the athlete condition are internal and external factor. Four elements to attain achievement are physical condition, technique, tactics and mentality. The use of advanced technology can be prominent factor to attain achievement. Most of athlete said that the obstacles found in keep their momentum during training are caused by the inappropriate maintaining ways and the unused of advance technology. One of the problem is the use of support instrument while training.

The relevance of choosing support instrument is one of important thing that should be considered by trainers while collecting the data about their athletes. One important thing before constructing the support instrument is the consideration about what should be measured and analyses. Basically, the purpose of the support instrument is to measure the athlete movement based on their skill.

Other than that, support instrument also should include with function that can record their performance while training so that they can understand feedback to improve their performance. This advance help coaches to increase athlete's performance by watching athlete's performance during training and from mistake by athlete. (Ong Kong Swee & Wee Eng Hee, 2006).

1.2 Problem Statement

To take part in tournament or sport event petanque's athlete must keep training for improving their performance. Training without any instrument that can help athlete detect their wrong while training is make athlete skill unstable and not prepare well. Plus, athlete cannot analyses and look back how their performance while training. In order to overcome this problem, the improvement of support instrument for petanque sport need to introduce to athlete. Those the athlete skill can be analyses and evaluated during training to improve their performance for tournament.

1.3 Research Objective

The objectives are as follows:

a) To introduce effective tool for improving athlete performance in petanque sport during training.

b) To normalize the right technique and method for athlete used during training.

1.4 Scope of Research

This project emphasis on measure the accuracy and precision the movement, acceleration and rotation angular of athlete body, arm and leg. It will also utilize the software that can depict the interrelationship between the movement and speed of arm according to the distance. This is because there was different throw speed and technique to any different distance. This project will be using the wireless transfer data from the system. The focus of this project is on petanque sport. The athlete will use it during training in order to increase their skill and performance.Radial distribution network with balanced load condition

1.5 Thesis Outline

Based on the objectives previously presented and on the approach proposed before, this thesis is made up of five (5) chapters, which contents are summarized as follows:

- Chapter 1. Introduction. This chapter begins with an introduction to the background of the study about improvement of support instrument for sport. It then describes the specific research problem statement of the study, objectives, project scope and project outlines.
- Chapter 2. Literature review. This chapter starts with review of the literature from the previous research that related to the improvement of support instrument for sport. It is based on reference from internet, articles and journals. Generally, this chapter provides the theoretical background of the study.
- Chapter 3. Methodology. This chapter presents an overview of methods that will be used in this project. The details of the implementation of the software and hardware will be included in this chapter. It also included with discussion on the process of this project.
- Chapter 4. Case studies. In this chapter, will proposed the expected results of the project. It then describes the achievement of the objective of this project. It will also include the result of the analyses data and observation.
- Chapter 5. Conclusion and future works. This chapter summarizes the main conclusions as well as achievements of the work undertaken in this research and suggests areas for future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Petanque sports is originated in France (Gilles, 2015). The game normally played in single, double or triplets only. Each player will use three boules in single and double, whereas in triples, each player has only two boules. The game in generally aim to throw hollow metal ball called boule as close as possible to a small ball called a cochonnet or jack, while the player is standing inside a starting circle with both feet on the ground. In this game, there have two position which are 'pointer' and 'killer'. Besides the 'pointer' throw the boules close to the jack, the 'killer' also can hit the opponents' boules away from the jack to get extra score.

Petanque commonly played on gravel and sandy surface, but can also be played on grass or closed field. The chosen of the diameter boule is normally based on the size of the player's hand. The weight of boule depends on player strength, position and playing style. Basically, the 'pointer' incline to choose heavier boules, while 'killer' tend to select lighter boules. The court is approximately rectangular area 15-17 meters long and width 4 meter. The boules basically throw from 6 to 10 meter away from jack (Daniel Dardailler, 2001). The court's surface is likely to be some areas hard and smooth and others rough and stony.

2.2 Sport Support Instrument

Many support instrument have been created in order to help athlete to improve a quality of their performance. Most of the sport instrument have been developed with the sensing for increasing quality of athlete. Normally, the developed support instrument is designing with the IMU to measure the performance of athlete. Unfortunately, for petanque sport there no any support instrument.

2.3 Previous Improvement of Sport Instrument

2.3.1 Racket Sport Inertial Sensor Motion Tracking Analysis

Berenice Mettler (2013), the racket system consists of an inertial coupling sensor to the racket, a processor connected to the inertial sensor and a memory device connected to the processor. The inertial sensor includes an accelerometer array with three acceleration degrees of freedom, and a gyro array with three rotational degrees of freedom. The processor is configured to generate stroke profiles that describe acceleration and rotation of the racket based on accelerometer and gyro array signals, and configure the memory device to store the stroke profiles.

2.3.2 Removable Motion Sensor Embedded in A Sport Instrument

Ke Zhao (2015), a solution is given to improve motion detection and identification of moving objects associated with different sports by intelligently integrating motion sensors into sporting instruments such as tennis rackets, badminton rackets, baseball bats and golf clubs, which are swung in a 3D environment. The motion sensors embedded within the sport instruments are locked securely and can be detached for replacement. An implanted and locked motion sensor inside a sport instrument is designed to detect motions associated with motions associated with the sport instrument. Through the embedded motion sensor, the

motion parameters associated with the observed motion are obtained and analyzed via a motion detection and recognition system. Different types of sport performance reports and performance improvement recommendations are created for users of the sport instruments based on analysis of the motion parameters.

2.3.3 The Use of IMMUs in a Water Environment: Instrument Validation and Application of 3D Multi-Body Kinematic Analysis in Medicine and Sport

Anna Lisa, Matteo Cortesi, Silvia Fantozzi, Andrea Giovanardi, Davide Borra and Giorgio Gatta (2017), instrumental validation of IMMUs in water and description of their use in clinical and sports aquatic applications using customized 3D multi-body models. First, several tests were carried out to map the magnetic field in the pool and to determine the best volume for experimental test acquisition with a lower mean dynamic orientation error. The gait and the swimming analysis were successively explored in terms of variables in spatiotemporal and joint cinematics. The extraction of only spatiotemporal parameters highlighted several critical issues and the joint kinematic information has proven to be an added value for both rehabilitative and sport training purposes. In addition, 3D joint cinematics applied using IMMUs provided similar quantitative information to that of more expensive and voluminous systems but with a simpler and faster setup preparation, a less time-consuming processing phase, as well as the possibility of recording and analyzing a higher number of steps / strokes without cameras limitations.

2.3.4 Wearable Audio and IMU Based Shot Detection in Racquet Sports

Manish Sharma, Akash Anand, Rupika Srivastava and Lakshmi Kaligounder (2018), wearables such as smartwatches equipped with sensors and powerful processors provide a strong forum for the production of sports-domain analytics solutions. For monitor player's games, though motion sensor-based shot detection has been extensively studied in sports due

to potential less extreme hand motion during shots is comparatively less explored. Computationally inexpensive and real-time shot detection system for table tennis based on fusion of Inertial Measurement Unit (IMU) and audio sensor data embedded in wearable wrist-worn. The system uses sensed shots to synchronize IMU and audio sensor data in time and achieves precision of 95.6 percent. During shots in swing based sports, the IMU embedded in wrist-worn wearable captures the acceleration and angular velocity of the forearm.

2.3.5 A Wide-Range, Wireless Wearable Inertial Motion Sensing System for Capturing Fast Athletic Biomechanics in Overhead Pitching

Michael Lapinski, Carolina Brum Medeiro and Donna Moxley Scarborough (2019), standard technology used to capture movement in sports for biomechanical analysis has been employed by marker-based optical systems. While these systems are excellent for providing positional information, they suffer from a limited ability to provide accurate basic quantities such as velocity and acceleration (thus forces and torques) during high-speed movement typical of many sports. Conventional optical systems take significant set-up time, can show sensitivity to outside light, and typically measure too slowly to reliably capture intense athletic activity bursts. Wireless wearable sensors have started penetrating devices used in sport performance evaluation in recent years, providing possible solutions to those limitations.

This article presents a wearable dual-range inertial and magnetic sensor framework that we have built to allow an end-to - end investigation of high-level, very large dynamic-range biomechanical parameters, after determining pressing problems in sports that such sensors could solve and survey the state-of-the-art wearable motion capture for sports. On college and elite baseball pitchers the system is tasted, then derived and measured metrics to