INTERNET OF THINGS' IMPLEMENTATION FOR SPORT SCIENCE (CASE STUDY: SMA NEGERI 8 TASIKMALAYA FUTSAL EXTRACURRICULAR)

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ABSTRACT

8 high school Tasikmalaya has many various extracurricular, including futsal as the most popular among the students. Futsal has became a trend among the students because it help them to fill spare time and improve their football capability. To develop their capability, surely need training for the players, Training become a support to increase player capabilities. Lot of training method that used, including agility and speed training, There are four tests used to gauge agility and speed of players, such as: zig-zug run, shuttle run, boomerang run, illinoist agility test. With support of Sport Science each tests has a achviement which has to achieved by the players. Sport Science needed to gain players potention and performance according to science implementation. In order to support Sport Science a tool needed to help scoring for agility test that has been done by the students of 8 high school Tasikmalaya. With Internet of Things technology, that utilize microcontroller arduino uni, NodeMcu serve as regulator and manager of input and output data which connected with various sensors.

Key Words: Futsal Extracurricular, Sport Science, agility test, Internet of Things, Microcontroller

PREFACE

By this time futsal has became a trend among students, beacuse this sport help to fill spare time and improve their football capability. 8 high school Tasikmalaya futsal team has achieved many achievement as in event Specs Futsal Ogy 2017 Competition, 8 high school Tasikmalaya futsal team became a champion and represent Tasikmalaya in national competition.

For maintain and intesify the achievement, school party wants the team to train intensely. Wherefore, training is a support to gain quality of players, one of several is agility training. In order to gain agility of the player, training methods are needed, such as : zig-zug run, shuttle run, boomerang run and illinois agility test.

The scoring of the four kind of tests is still doing manualy, otherwise, monitoring the progress of the tests, this lead into a problem for the coach and staff. With support of Sport Science, each test has achievement that must be achieved by the players during the test, and later the test will be scored and determine the quality of the players. According to the science implementation, Sport Science needed since it help to gain players' potention and performance immensely. Along with IoT technology, Monitoring and controlling every device, although the system become completely easier than usual. Therefore a tool needed to monitoring the agility training with IoT system which applied with sensors.

THEORETICAL BASIS

1. Sport Science

The application of discipline study of science principle and techniques that aim to improve sport performance(Sport Science) are generally divided into three scope, such as: physiology, pshicology, and biomechanics. Each scope has its role as well. Sport Science began at the time a committee of sport formed in 1958 in India, in order to research lowest sport performance in their country for the international

level. Then England, in 1977,founded The Society of Sports Sciences.

In physiology scope, Sport Science study how body get respsonse and adapt with undertaken traing. Physiology scope avail identification of strength and weakness through fitness test, assess, whether, the successful of the training and design and develop other training techniques. As explained, by this scope there are activities to gain players' strength such as, gauge the agility of players according to principle of Sport Science.

2. Internet of Things

Internet of Things is a concept of exchange connectivity over things around it. IoT support integration, delivery and data analysis generated by connected device using sensor. Internet of Things conceive a connected device with human activities which has a purpose to improve quality of life. Organize and relieve user needs.

According to Burange & Misalkar, Internet of Things is a structural object provided with exclusive identity and capability to move data over the network without second-way human relation neither from source to destination nor human interaction with computer. Wherease according to Keoh, Kumar dan Tschofening, 2014 Internet of Things is a promising scientific development to optimize life based on sensor and tools which join together over the internet connection.

Internet it'self getting known since 1989. In 1990 Jhon Romkey invented a toaster device that can be turn on-off over the internet. In 1997 Paul Saffo, provide a brief explanation about sensor. And in 1999 Kevin Ashton, president of Auto IDCentre, MIT invented The Internet of Things, also a tool RFID(Radio Frequency Identification) global identification system in the same year. This is the biggest invention of Internet of Things.

3. Web

Web is an abbreviation of World Wide Web and usually abbreviated to www. Web is a part of internet ,wherefore association server site over the world that works to provide informations.

4. Android

The opensource part of system operation. First time developed by Android Inc. The system operation made particularly for smartphone and tablet computer.

In 2005 Android Inc has taken over by Google. And in 2007 Google established hardware and software companies and telecommunications to advance open standards for hardware products. October 2008 is the beginning of emergence of a mobile phone based on Android operating system.

The interface of android user based on direct manipulation, and use input accord within the real world such as swipe, tap, tweak and reverse to manipulate object on the screen.

5. Microcontroller

Device that designed for general needs to control machine or system, using program and save it in ROM, that usually called microcontroller. Following is used microcontroller :

a. Arduino Uno

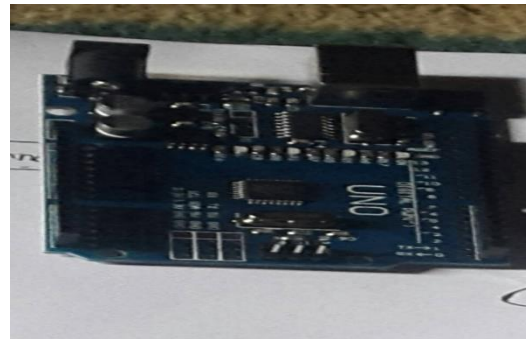Arduino generally is an opensource electrical platform and easy to use.

Image 1. Arduino Uno

b. NodeMCU ESP8266

NodeMCU is opensource and a part of platform Internet of Things. Consist of hardware, System On Chip ESP 8266 from ESP8266 made by esprisif Sistem.

NodeMCU analogous as arduino ESP8266 board and has packaged ESP8266 into a compact board with various features as a microcontroller and WiFi access capability.

Image 2. NodeMCU ESP8266

6. Sensor

A type of transuser used to convert mechanical, magnetic, heat, light and chemical quantities into electrical voltages and currents is commonly called sensor. It is often used to detect when measuring or controlling.

a. Ping Ultrasonic Sensor

A signal from ping sensor will reflected back and accepted meanwhile an object detected. Since, ping sensor works by compressing generated ultrasonic signal.

Image 3. Ping Ultrasonic Sensor

b. Pulse Heart Sensor

The sensor used for detect heart pulse. Designed with utilize to recieve a light.
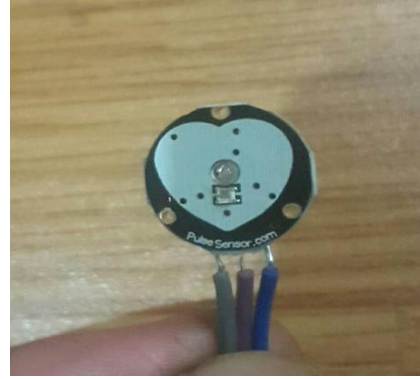
Image 4. Pulse Heart Sensor

c. Vibration Sensor

This sensor used for detect any movement and attached inside a training-cone. If a player touch any obstacles during the test, the sensor will be active, and give a signal that test has failed. The signal given by this sensor is a data status and sound a beeping as the sign.

Image 5. Vibration Sensor

RESEARCH METHODS

Researh methods is a method that used to solve a problem and requires data with the result that a research can be done, here is the research methods :
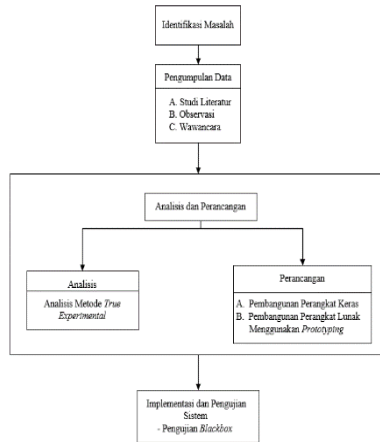
Image 6. Research Methods

1. Formulating of Problem

Formulatin of problem is one of the most important step, wherefore determine a problem found by the its study case.

2. Data Collection

The data collection method used for this research are :

a. Literature Study

Data Collection related with research and development of system.

b. Observation

A direct research and review at 8 high school Tasik malaya addressed at Jalan Mulyasari No.3 Tamansari Kota Tasikmalaya Provinsi Jawa Barat.

c. Interview

Data collection with doing an interview with coach and staff 8 highschool Tasikmalaya futsal team, to obtain data of the players.

3. Analysis and Design

Analysis is defined as an attempt to make an understanding of an obtained problem, and design is an attempt to make or build something to produce as specific goal..

a. Analyisis Method True Experimental

In the true experimental method the researcher can control all external varables that can affect to the course of the experimental. There are two forms in this design such as :

- *Posstest- Only Control Design*

Dalam desain ini tedapat dua kelompok yang masing-masing dipilih secara random. Kelompok ynag terlebih dahulu diberi pelakuan dan kelompok yang selanjutnya tidak diberi perlakuan apapun. Kelompok yang diberi perlakuan disebut kelompok kontrol. Pengaruh adanya kontrol adalah $(O_1:O_2)$.

- *Pretest-Posttest Control Group Design*

Dalam desain ini terdapat dua kelompok yang dipilih secara acak kemudian diberi pretest untuk mengetahui keadaan awal adakah perbedaan antara kelompok eksperimen atau kelompok kontrol. Pengaruh perlakuannya adalah $(O_2-O_1)-(O_4-O_3)$.

b. Perancangan

Pembangunan perangkat lunak dalam pembuatan aplikasi ini menggunakan model prototyping. Karena dengan menggunakan model prototyping proses pembuatan softwarenya mengizinkan pengguna untuk memberikan gambaran dasar tentang program serta melakukan pengujian diawal. Dan juga proses pembangunannya terus berulang- ulang sampai pihak pengguna merasa aplikasi sudah cukup memuaskan.
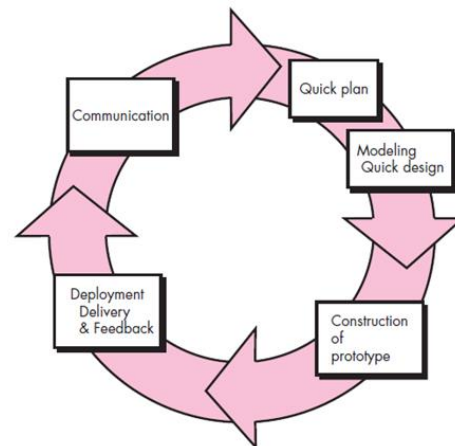

Image Source; Roger S. Pressman

Image 7. Prototyping

STUDY

Pada penelitian ini dilakukan beberapa tahapan diantaranya, pembuatan arsitektur sistem. Pembangunan perangkat lunak, perakitan perangkat keras, analisis kebutuhan fungsional, perancangan antarmuka, jaringan sematik.

1. System Architecture

In this stage, explain about used general system mapping, following image of system architecture, given below :
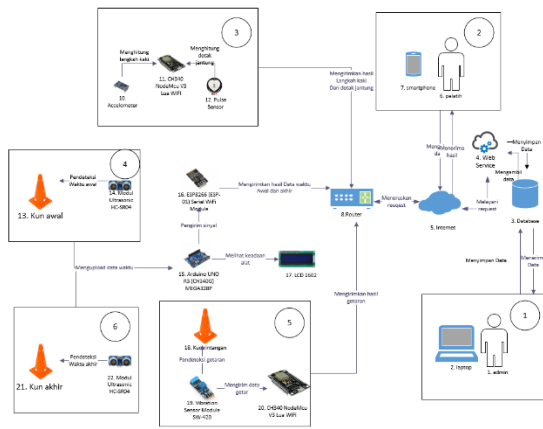

Image 8. System Architecture

In this system architecture uses WiFi connectivity and users can use a smartphone a medium to carry out the agility test..

2. **Software Development**

Based on the result of software development, the following main page views of web-base applications and mobile-based applications have been built :
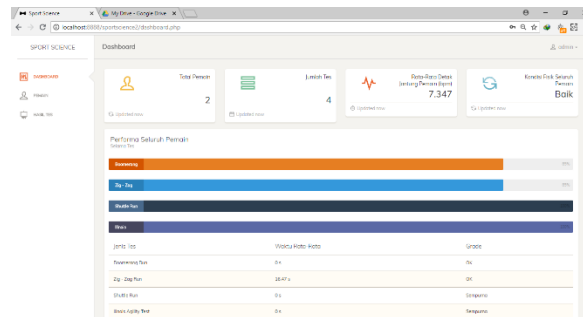

Image 9. Web Application Interface

Admin as s web application user can login first by fill username and password to enter the main page Admin can add players to the system before the trainee test them, and also csn review the result from the test .

In addition there is mobile application feature interface for coaches to do agility test, as the given at following image below :
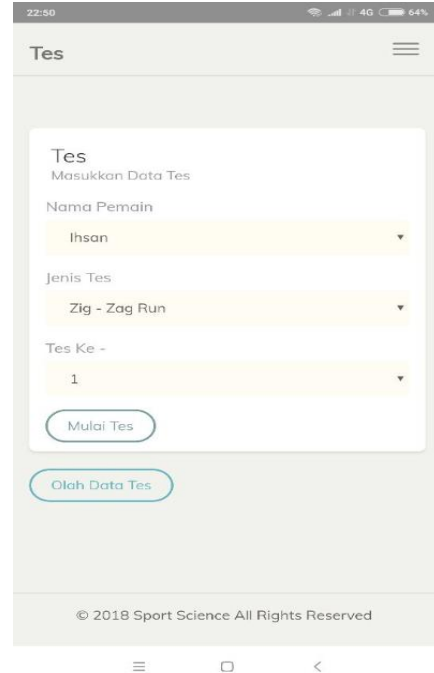

Image 10. Mobile Application Interface

In this application trainers can test players by preparing the tools if all set as well, trainers can start the agility test immediately, The result from the output is a data of time, average heart rate during the test and also the average footsteps. Coach can also see the overall results from each test.

3. **Hardware assembly**

At this stage the assembly of the hardware is used to test the agility of players which have been describe previously in system architecture section, Here are the hardware that has been assembled :
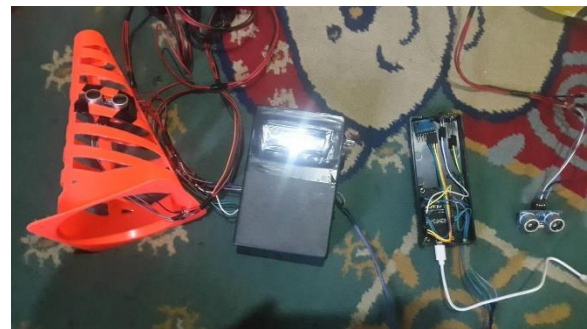
Gambar 11. Hardware Assembly

Based on the result of the reserch all the hardware elements in the image above, have been functionally tested. It is considered feasible to be implemented int the actual situation..

4. Functional Needs

Describe the process of activities in the system and explain needs needed for the system to work properly, Analysis using UM, following are the stages of UML modeling :

1. Usecase Diagram

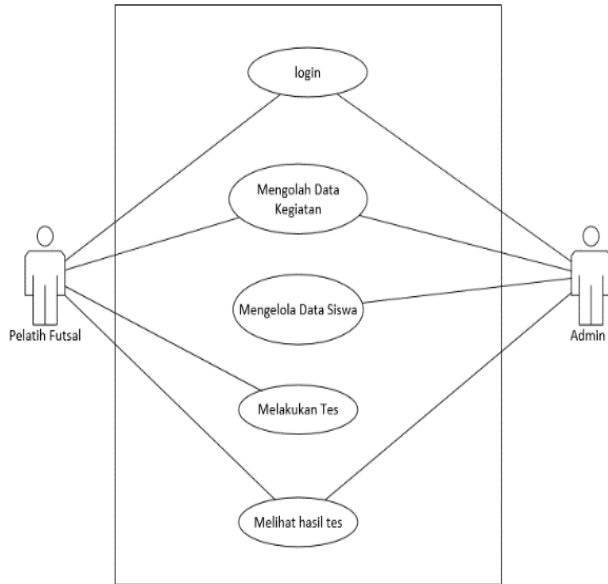A diagram showing functionality of a class , uasually called use case diagram.

Image 12. Usecase Diagram

2. Activity Diagram

Activity diagram modeling workflow from the squence of activities in a process that refers to use case diagrams..
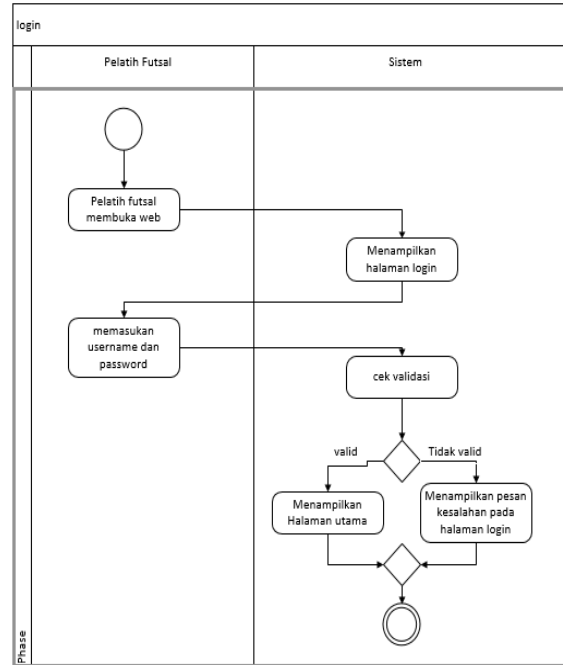

Image 13. Activity Diagram Login

3. Class Diagram

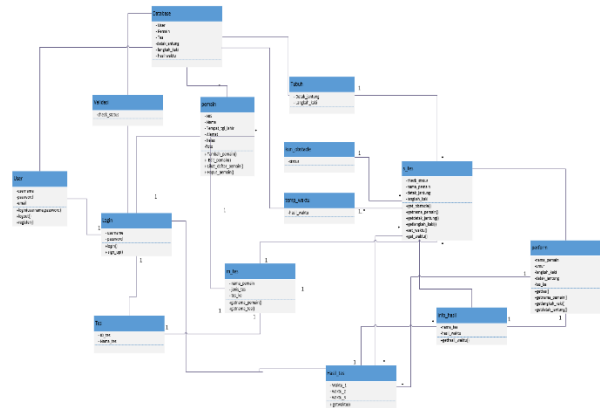Class diagram describe used classes to display classes in the application.

Image 14. Class Diagram

4. Sequence Diagram

In sequence diagram dercribes behavior of the object in use case by describing the object's life time..
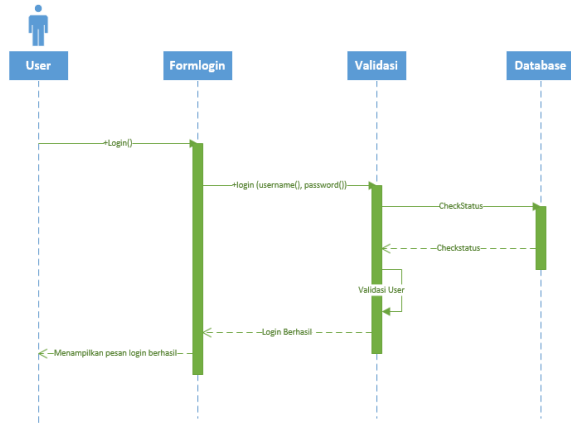
Image 15. Sequence Diagram Login

5. Interface Design

Interface design made to describe the rough appearance of program.which used by users to interact with the system..
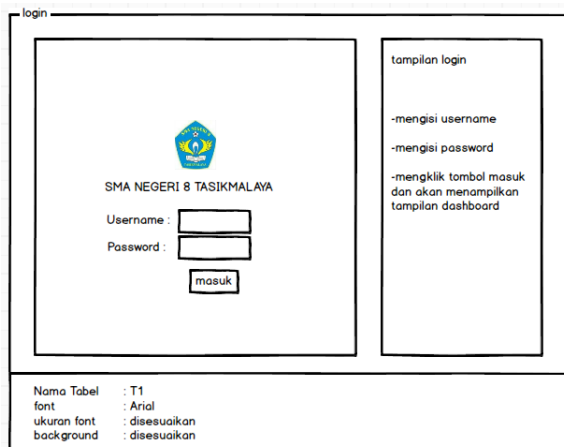

Image 16. Login Interface

6. Semantics Diagram

The semantic network explains about network design that connect menu that can be accessed by the user accompanied with a warning message. Here is a picture of a semantic network on the system:
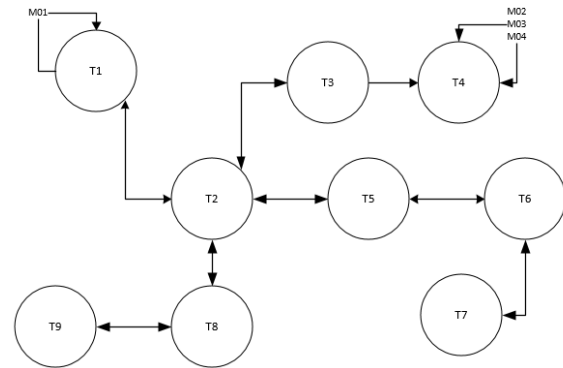

Image 17. Semantics Diagram

7. Testing

The test is carried out on the application functionality to assess whether the application that is built meets the needs or less functionality according to the requirements contained in the application design.

a. Blackbox Test

Blackbox testing is used to explain the testing of the running system by testing the software function in the implementation of IoT for Sport Science in futsal extracurricular activities at SMA Negeri 8 Tasikmalaya.

b. IoT Hardware Test

IoT hardware testing is a test to measure the success rate of the tools used in the Internet of Things implementation system for Sport Science.

c. Beta Test Scenario

Beta testing done by directly obsessing at the research site using questionnaires or interviews from the research site by asking the following questions:

Question to Mr. Rizal as futsal extracurricular coach of SMA Negeri 8 Tasikmalaya.

- *Does this system help you in assessing for the agility tests for the players ?*
- *What do you think about the usage of the system and the tools used in each of these instruments ?*
- *What is your suggestion and advices for the next, so that this system can be better ?*

CONCLUSION

Based on the research results obtained, it can be concluded as follows:

1. *The builted tools help the coach and staff in assessing each test.*
2. *Provide information of the player's performance during the test and on the results of the agility test.*

Suggestion

Based on the results of the research as for the suggestions obtained for the development of the internet of Things implementation for futsal extracurricular sport science, SMA Negeri 8 Tasikmalaya as follows:

1. *Necessary to develop the interface so that it can be better, and more easier to understood by the users.*
2. *There need a change in the timer, since the result time data has considerable delay.*

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