**Bowling Action Evaluator Application**

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**Project Goal and Objectives:**

* **Motivation:**

The main motivation of our project came from the enormous popularity of cricket over in India. Bowling in cricket is a crucial part for every bowler to bowl correctly and snatch the wickets at regular intervals of time for low runs in order to win a match. Many youngsters have a desire to learn bowling. They may not hire a professional coach in initial days for coaching. Through this application they can try different types of bowling activities and can know whether they are bowling consistent or in consistent.

* **Significance:**

There are currently different types of Biometric Sensors being used by International Cricket Control (ICC) in order to test the bowling action of a bowler whether it is legal or illegal. This mechanism will form a animated image of the bowler and his bowling action. A committee meant for testing the action will go through certain angles of the hand and wrist of the players in an animated image and decides whether it is legal or illegal. It is too expensive for players to setup mechanism in order to test their bowling action. Through our Application players can check whether their bowling action is correct or in correct.

* **Objectives:**

As our course deals with collection of data from various sensors and then analyzing the data to predict the output by training the test data. We would like to design a mobile application that evaluates the bowling action of the player whether it's correct or in correct based on the action bowled by the player. We would like to use the Sensor Tag for this application. Initially a player will connect his sensor tag with the app and starts bowling. When he completes bowling he will get his result whether its correct or in correct. We would like to collect X,Y,Z values from the sensor tag and store them on H Base. Then we would like to train data with these values in order to predict the bowling action.

* **Future Enhancements:**

Future Enhancements can be done to the application that we are going to develop. Some of those includes evaluating the bowling hand performance for bowling, Hand Striking performance for golf etc.

* **System Features:**
* CC2541 Texas Instruments Sensor Tag.
* Android 4.3 or above OS.
* Bluetooth 4.0 compatible android device.
* **Technological and Architectural requirements:**
* Hadoop/Mahout/R, H Base etc.
* Linux, Eclipse, Java etc.
* Data collected from sensor tag.

**Activity Recognition Scenario and Data Collection:**

Detecting bowling action in cricket game is the main activity in our project. For this a sensor is tied to bowlers hand first. When bowler bowls then motion is detected using sensor. We collect data with respect to the motion of the bowler. Depending on the data we analyze and provide some results and suggestions for bowling.

o **Devices/Sensors :**

* For this we use android application for user interface.
* We develop our application using eclipse android ADT IDE
* We debug and test our application on Samsung Galaxy S4
* We are using Texas Instrument CC2541 Sensor Tag Development Kit

This tag include six sensors

a. temperature,

b. humidity,

c. pressure,

d. accelerometer,

e. gyroscope,

f. magnetometer.

* In this we are using accelerometer, gyroscope and magnetometer
* The establishes a Bluetooth connection with the device and transfers information

o **Data Collection**

* Initially we input some training data samples into the system.
* We use HBase to store our data and models
* We train this data and generate some models.
* For generation of models we are planning to develop a clever algorithm to detect motion perfectly.
* Then while application is running, data of accelerometer, gyroscope, and magnetometer from the sensor tag is collected on the device using Bluetooth.
* This data is pushed into HBase.
* We implement a mapreduce program to analyze and produce results.

o **Motion/Activity Model**

* Coming to Motion model, this application basic requirements are android OS device with Bluetooth, to run application and a sensor tag.
* Sensor tag will be attached to bowler first.
* We start application in play mode.
* Now the bowler bowls the ball.
* Using sensor tag we collect motion data.
* Analyzing data then provide results and suggestions to the bowler.

o **Analytical Tasks**

* Analytical task include
* Detection of motion pattern
* Build models with respect to patterns
* Evaluate new input data and match pattern with highest probability
* Produce output results.

**Design of Mobile Client:**

We would be developing Android mobile app for our project. Mobile Client would consume Java RESTful Web service.

**Features:**

* Android framework supports single application model that lets us deploy our app broadly to hundreds of millions of users across a wide range of devices—from phones to tablets and beyond.
* Framework enables reuse and replacement of components
* It is based on open source Webkit engine
* It is powered by a custom 2D graphics library and 3D graphics based on OpenGL ES 1.0 specification

**Related Work:**

**Street Bump App:**

This app is used to locate potholes in the city. Users need to place their mobile phones in their vehicles and turn the app one and drive. Whenever the user encounters a pothole then location is recorded by the app and uploaded on the cloud. Repairs would be done based on the data collected. With the help of this app around 20,000 potholes were repaired.

**Biometric sensors used by ICC:**

International Cricket Council(ICC) uses lot of sensors like Inertial sensors, acceleration sensors, rotation sensors etc to decide illegal action of bowler. Inertial sensors are used to detect whether an object changing in its velocity of motion or angle from the defined limitations. Acceleration sensor would verify the movement of ball from one point to another and rotation app would sense the angle of movement. With help of all these sensors illegal action of bowler is detected.

**Bibliography:**

<https://msbfile03.usc.edu/digitalmeasures/oleary/intellcont/StreetBump-1.pdf>

<http://www.thesportsmirror.com/2012/08/can-inertial-sensors-accurately-detect-illegal-bowling-actions/>

<http://www.cs.odu.edu/~cs495/Papers/app-006.pdf>

<http://research2guidance.com/mhealth-market-sensor-based-mobile-apps-show-how-mhealth-business-models-could-work/>