

Research manual

Year 4 Project



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# Introduction

For my project I will be designing a wrist wearable for the games of pool and snooker. The idea for the wearable is to help beginners to the sports monitor and track their strokes and movement on the shots they take. This allows them to see what they are doing wrong or what they did differently on a given shot compared to what they should have done. The current plan for the wearable is to build up a profile on the player so it gets familiar with how the player plays, this includes the speed of play, how many strokes they perform before they take a shot and what type of shot they are currently practicing.

In this document I will be looking into the different wearable devices I could possibly use. I will go into detail on each wearable and then conclude with why I chose a certain one. I will give a brief overview of the games of snooker and pool and I will go into detail why I believe this wearable could help improve beginner’s skill level quicker than if they just practiced with no help. I will go into detail on the movesense wearable I will be using and what is possible with this device. If they are any other similar applications on the market, I will give overviews of them and explain what is different and unique about my proposed wearable. In terms of the technology I will use, I will be explaining some of the different frameworks, languages and databases that I could use for this proof of concept project and narrow these down to the ones I will be using in the final product.

# Snooker and Pool:

Snooker and pool are cue sports that are played with two players that attempt to pot balls into pockets with wooden cues. There are many different variations of how these games can be played. A players skill level is basically judged off how well and consistent they can pot balls. A number of different factors contribute to this skill. Firstly a player tries to have the same stance for each shot they take, some players have different rituals and approach to how they stand but the idea is similar. Players then proceed to get as low and level as possible with the cue before they address the cue ball. Most players use their chin as a rest for the cue and it also helps with stability. They then proceed to push the cue back and forth before taking a shot, this is similar to how golfers have a couple of practice swings before taking a shot. This is the part of the players movement I wish to record with a wearable and see if I could use the data gained to improve the players “cueing” as it is called amongst players.

A picture containing pool ball, pool table, grass, sport

Description automatically generated

(Anon., 2016)

# Movesense:

The movesense platform is developed by a Finnish manufacture called Suunto. It was originally started as a project to build a heart rate sensor for the company. As the development continued, they experimented with full motion sensors and this was eventually added to one of the movesense prototypes. This gave them the realisation that it could be used for so much more than just a heart rate monitor such as sports monitoring. From here the company decided to make the movesense project public. The movesense sensor is mass produced and is available to order in any amount and be used by any company or developer.

A screenshot of a cell phone screen with text

Description automatically generated

(Anon., 2016)

## Movesense specifications:

* 9-axis motion sensor: acceleration, gyroscope, magnetometer
* Heart rate, R-R- intervals, BLE heart rate service, optional: single channel ECG
* 1-wire expansion bus
* Temperature
* Data logging memory
* Bluetooth® 4.0 radio
* Tools for developing customized applications that run inside the sensor
* Software libraries for developing compatible mobile applications
* Wireless firmware update capability
* Recognizes its attachment base through unique ID in Movesense connector

(Anon., n.d.)

# Similar Applications:

After researching I was unable to find a wearable that has already been developed that would offer a similar use for players. There are plenty of mobile applications that are there for players to use to practice but these are used more for practice routines and a place to record a players statistics. The applications will show a player a set up routine for the balls and the player must repeatedly do this routine till they have completed it. They also give tips for how to control the cue ball in the game such as explaining how to use topspin, backspin and using side on the cue ball to manoeuvre it around the table and to the desired position. These applications all offer much the same idea, some examples include Snooker Coach 147, Kick Shot Image Training and Billiards Lessons.

## SightRightUK:

SightRight is a sighting and alignment test or trainer to improve players. It was developed by Stephen Feeney. This technique has been used in multiple sports such as Golf, Darts and Snooker. In the game of Snooker, SightRight aims to improve players Potting Angles, Potting accuracy, Cue action, stance and positional play. This is similar to my proposed idea as I am trying to improve some of these same skills with my wearable.

A picture containing clipart

Description automatically generated

(SightRight, 2018)

# Technology (Frontend):

Xamarin Framework:

Xamarin is a Microsoft owned open source cross-platform framework for iOS and Android. Developers can use this framework to build applications with C# and .NET. The .NET platform is made up of different tools, programming languages and libraries and Xamarin adds additional tools for developing mobile apps. With Xamarin in visual studio, a developer can write code in the C# language and the same code can be used on all three platforms. Xamarin is the only IDE that can be used in Visual studio to build apps for native android, iOS and windows app development.

(Irshad, 2017)

A close up of a sign

Description automatically generated

(Daniel, n.d.)

## C# Programming Language:

C# was developed in 2000 by Anders Hejlsberg. The language is object-oriented and was Microsoft’s answer to the Java language. With all the support Microsoft offers C# has now grown to one of the most popular language’s in the world. It is designed for the development of apps on the Microsoft platform primarily and it requires Windows and the .NET Framework. C# can be used to create Desktop Applications, Web Applications, Games and more recently it has been used for mobile platforms. Xamarin has allowed to use the language to develop for all mobile devices with the one main codebase. C# is also very popular for game design with almost a third of top games being developed in C# and using the Unity Engine.

A close up of a sign

Description automatically generated

(Anon., n.d.)

C# is a very high level easy to learn language. It is a statically typed language, this means the code is checked before it is compiled so it is easier for beginners to see mistakes quicker. Although it is considered one of the easier languages to learn and get started with, it is hard to master and requires a lot of knowledge for more advanced programmes. It is currently the 4th most popular language to develop with. There are also many online courses and learning sites to learn C# such as the SoloLearn application and course.

## .NET Framework:

The .NET Framework is a software development framework created by Microsoft which is installed and used on window-based operating systems. The first version of this framework was released in 2002. .NET supports multiple programming languages such as Visual Basic and C# and can be used to develop Form base apps, Web based apps and Web Services.

A screenshot of a cell phone

Description automatically generated

(guru99, n.d.)

### Language:

This first step is for the programming language used.

### Complier:

There is a different complier for each language used. For example, if it is the C#.NET language then the C#.NET complier is used. This compiler will send the program to the CLI.

### Common Language Runtime:

The CLI is the platform where the programs are executed. The platform has many features such as Exception handling and garbage collection.

## Libraries:

The .NET framework includes collections of methods and functions that are then organised into standard class libraries.

# Technology (Backend):

## SQLite:

SQLite is the most used database in the world. It is an embedded database engine that read and write directly to ordinary disk files. The file format for this database is cross-platform so you can copy an existing database between 64 and 32 -bit systems an also between different architectures. The project was started in the year 2000 and the developers intend to support the database into the foreseeable future.

A close up of a logo

Description automatically generated

(seekvectorlogo, 2019)

## Realm:

Realm is an open source database management system. It was originally created for android and iOS but can be used with React and even Xamarin developers. Although Realm has some similarities to SQLite, they are completely separate databases. Some of the main features of Realm include Faster queries and cross platform utility. The Realm management system provides an object interface in programming languages including Objective-C, Swift, Java and C# for object orientated developers.



(Realm, 2019)

# Conclusion:

For my project I decided to use the movesense wearable for development purposes. From research I have seen movesense has been used for several different sport wearables and monitors. The project will be implemented as a wrist wearable which tracks the movements of the user’s back arm. As the user’s arm goes through the motions of taking a shot in the game of pool/snooker, I am hoping I can get these subtle movements recorded from the movesense device and be able to build a profile for a user on how they take shots. For a player to play a shot perfectly every time, they try to take a shot the exact same each time and vary as little as possible. With the wearable I intent to be able to detect what a player did differently on a specific shot, and this will hopefully be able to allow the user to correct themselves.

For the Framework and language, I intend to use Xamarin and C# to develop for an Android and iOS application. I have used this framework and language before, and I found it very useful. For this project the user will be playing or practicing in a club usually so the application would be better developed for a mobile device so the user can track their progress while playing. This will allow me to develop for both devices with the one codebase as I would need an Android and an iOS version of the application if it were to be used in production.

The database I will be using is SQLite. The Xamarin framework recommends SQLite as it is a basic and easy to use database that you can store and retrieve with on an Android device. To use the two together you just need to include the SQLite.NET library and add the corresponding NuGet packages to the project. For this proof of concept project, I will not be storing much data as I will only have a couple of test users and I will use the data to compare and contrast between players to see if it can be distinguished which player Is using the wearable at a giving time. This will give me some insight into how accurate movesense can record the movements and if I will need extra details about a players physique such as a players height or arm length.

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