System Requirements Specification
CSE 4316: Senior Design I
Fall 2017

Team APT
Automated Personal Trainer

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Revision History

Revision	Date	Author(s)	Description
0.1	10/18/2017	KJM	Document creation
0.2	10/30/2017	KJM, IS, CN, KJ	Complete draft

Contents

1 Product Concept

The automated personal trainer project is an automated trainer designed to improve and provide feedback on the user's form when they are working out. The product is intended for either at home or at the gym, it will also be portable for the user's convenience and not limiting them one area for their workouts. The fitness trainer is designed to duplicate the experience of a real life personal fitness trainer at a more affordable price. Users will be able to have their workouts recorded and receive feedback on how they can improve and be able to see which part of their workout is flawed. The fitness trainer will also track and give basic statistics of the user's data to see how much they've improved over time.

1.1 Purpose and Use

The product should record the workout of the user and analyze their joint movements, comparing the data with our functional database of what a good workout is and return feedback after the comparison. The user is expected to enter the workout they are doing and perform it in front of the camera for a functional feedback on their form.

1.2 Intended Audience

The intended audience for this product ranges from gym experts looking to perfect their form to a novice who is looking for guidance and an alternative to a real life trainer. If made publicly or commercially, the customers who would purchase it will be those who are starting to start actively working out and needs guidance, people who are already working out but wants a cheaper alternative to a real life fitness trainer, or gym gurus that are looking to perfect their form.

2 Product Description

The Automate Personal Trainer utilizes a Kinect camera for skeletal tracking in order to analyze and provide feedback to users about their specified workouts. The feedback will let the user know whether their form was correct or how it was flawed and what they can do to improve.

2.1 Features & Functions

The product uses a Kinect camera which is capable of skeletal tracking to provide the user with constructive feedback of the workouts. The device will analyze the user's form during their workout and the angle movements based on the selected workout by the user. Once the data is collected, the program will decide if it is a acceptable workout form after comparing it to the standard base of workout forms. It does not give the user real time feedback as it needs time to process the data. It does not provide a custom regimen based on the user's data for working out.

The product is presented as a mobile stand with the Kinect housed on a flexible mount that can be repositioned to fit the user's preference. The main components the product consists of include an Xbox One Kinect Camera for the front-end skeletal tracking and recordings to be translated into raw data, an Intel NUC mini PC for the data processing and back-end calculations, a portable battery to power the Kinect and Intel NUC, and mobile stand for user location preferences.

2.2 External Inputs & Outputs

The product will require user skeletal calibration to begin the tracking phase. The user must input their personal data and specifications (e.g. height, weight, gender, age, physical constraints) for the most accurate feedback.

2.3 Product Interfaces

The Automated Personal Trainer will be accompanied by a mobile application for easier user interaction with the device. More information will be provided in the future as the application has not yet been developed.

3 Customer Requirements

The final deliverable will include both a physical component along with a software component. The physical component will be a unit that will house a Kinect, a computer, and a portable battery to power both components. The software will provide a communication interface to the physical component. The physical unit is required to record and process visual workout video and communicate its outputs to the software component. The software component is required to pull data from the physical unit and present the information in a useful and intuitive way through a mobile UI interface.

3.1 Skeletal Tracking

3.1.1 Description

A Kinect paired with a computer server will be required to track and process user movements. Ultimately the Kinect forms the basis to providing feedback to the user based on software that will manipulate raw image data from the Kinect. The server will aid the Kinect in data processing and serve as a relay to other services.

3.1.2 Source

The Kinect was chosen due to its commercial support and existing API integration. While there are multiple Camera devices that can be used for skeletal tracking, none of them have the level of support that the Kinect has. The physical computer server was built based on the performance requirements of a early skeletal tracking prototype.

3.1.3 Constraints

Constraints of skeletal tracking include fixed point tracking meaning that devices like the Kinect support only a certain amount of body points to track. Other constraints include baggy clothing impeding the Kinect vision and distorting skeletal tracking. Development is still in its early stages and thus, the only constraint so far for the computer server is financial constraints.

3.1.4 Standards

Angle Tracking - Degrees
Computer Server - x64 based Architecture

3.1.5 Priority

High

3.2 Software Interface

3.2.1 Description

The software interface will act as the client to the server (Kinect) and will serve as the controlling component of the physical unit. This interface should keep track of the users fitness program along with how well the user performed the fitness tasks. The software should be cross platform independent meaning it can support both Android and IOS and it should be intuitive with a minimal learning curve.

3.2.2 Source

This interface acts as the client in the client/server architecture. This requirement came from the sponsor Alex Nunally in order to keep the unit adaptable to many users and not have the display fixed to the physical unit via a wired display.

3.2.3 Constraints

Among the larger constraints are Internet speed and client device capability. Depending on the Internet speed of the consumer, feedback will have to be compromised between streaming workout data to downloading workout data on client device. With the various IOS and Android versions special software such as Xamarin will have to be deployed in order to shorten time of development.

3.2.4 Standards

-IOS
-Android

-Client / Server

3.2.5 Priority

High

4 Packaging Requirements

The product is still in the developmental phases, therefore a prototype has not been completed. Once the prototype is developed, the product will go through further testing and physical optimization before the packaging requirements are released on the product logistics and physical attributes.

5 Performance Requirements

The performance requirements will be determined at a later phase as the product is still in the testing stages and most functions have not been tested for time.

6 Safety Requirements

The design for the product is still in the development phase so until there is a prototype, safety requirements are theoretical which may or may not include requirements such as safety brakes, air circulation to prevent mini-PC from overheating, and protective covers for potential liquid damage. The rest will be specified after further testing.

7 Maintenance & Support Requirements

The product will continue to update the software application after it is released, adding on new workouts into the database, improving the GUI, fixing any bugs that will arise, providing new features, and any other technical assistance the user might require. Physical maintenance and support will be provided per user's demands, will include possible upgrade or replacement of internal battery or mini-PC, fixing and replacing Kinect camera should a problem arise, and replacement for any damaged parts. These are all possible

maintenance and support that will be provided for the product, further more will be added after further testing.

8 Other Requirements

The product is still in the developmental phases so not all functions and requirements are figured out. Any other requirements will be included after a prototype has been completed to avoid labeling something an "other requirement" when it is included in the prototype.

9 Future Items

The product is currently in the developmental phases so there are no clear requirements and functions that are feasible in the prototype, therefore potential future items are not available until the product has been developed into a prototype and going through extensive testing.