Florida International University
Knight Foundation School of Computing and Information Sciences

Software Engineering Focus

Level Bar Project
(Documentation W.I.P)

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Abstract

The gym for newcomers can be intimidating due to a lack of knowledge in the utilization of the equipment present. There is a substantial amount of exercises that require multiple hours of practice to get right. Even those that attend the gym constantly have issues getting accustomed to certain work-outs.

With the Level Bar, we aim to help any gym-goer, be it a beginner or an experienced lifter, obtain the "perfect rep" to get the best results possible in a shorter period of time. By attaching the Level Bar to any barbell, users would be able to tell the quality of their reps by observing the stability at which such are being performed.

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INTRODUCTION

The Level Bar Project strives to provide users with an easy way to perform the "perfect" rep. Through a user-friendly UI and sensors that are already calibrated to the "perfect" rep this device would help you easily achieve the "perfect" form while performing your workout routine.

CURRENT SYSTEM

The current method for checking if the device is level takes into account only the horizontal axis. This leads to improved reps on a horizontal axis and allows for the person exercising to more closely reach the "Perfect rep".

Purpose of New System

Through the addition of this new system, the inclusion of the vertical axis and updated UI will allow the person to reach a more consistent rep while using a more intuitive Interface. With the inclusion of the new axis the user can closely monitor how far down their form reaches and can replicate it in order to be more consistent. With the inclusion of the new User Interface we have attempted to make a design that can be perceived more intuitively by the user.

User Stories

This section serves as an overview for the user stories that were developed throughout the semester. All of our required user stories have been mostly completed and the device operates optimally to provide the user with the “perfect” rep form. Additionally we have brainstormed an extra improvement that the device could do that would make the users’ experience much easier in obtaining the “perfect” form and have added that to the backlogged acceptance criteria.

Satisfied Acceptance Criteria

T1 - Sensors calibrate correctly to give the user input on how far away their current form is away from the “perfect” rep.

T2- User friendly UI that is easily understandable.

Backlogged Acceptance Criteria

T3- Sound feedback when you have obtained the “perfect” form to notify you that no more adjustments are needed.

Implemented User Stories

- **User Story 1 - Implement previous teams design**
  Replicate the design presented in the previous groups work as much as possible and optimize the code's purpose.

- **User Story 2 - Assembling the arduino**
  Assemble the device and begin importing the code onto the arduino to begin running tests for obtaining the “perfect” rep.

- **User Story 3 - Research different display types**
  Look for a different display monitor that would better serve the project and properly display the information needed while being reasonably sized.

- **User Story 4 - Minimize the size of the device**
  Get the device to be as small as possible while keeping the cost low. The device needs to be easily accessible and fit at least onto a bench press and ideally a dumbbell.

- **User Story 5 - Improve the UI of the program**
  Make the UI more user friendly and as easily maneuverable as possible.

- **User Story 6 - Front/back end**
  Back end tests for the sensors and seeing if they can calibrate correctly on a bench press and actually help obtain the “perfect” rep. Front end tests to maneuver the UI and see if it even outputs onto the small monitor we have obtained.

- **User Story 7 - Update design**
  Look for a more compact device and further improvements to the UI and functionality of the current device. Future developments would ideally include sound feedback to let you know when you have obtained the “perfect” form and to get a device that is optimal for gym goers.

Pushed Back/Planned for later:

- **User Story 8 - Updating device and sound functionality**
  Sound functionality is a future implementation that we believe would highly benefit the user and easily help notify them when the “perfect” rep is obtained.

Project Plan

This section describes the planning that went into the realization of this project. This project incorporated agile development techniques and as such required the sprints to be planned. These sprint plannings are detailed in the section. This section also describes the components, both software and hardware, chosen for this project.

Hardware and Software Resources

The following is a list of all hardware and software resources that were used in this project:

- Arduino Nano 33 BLE IoT
- Adafruit 2.0" 320x240 Color IPS TFT Display
- Arduino IDE

Sprints Plan

Sprint 1

Date: 5/16/2022
Meeting Time: 1 Hour

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After discussion, the velocity of the team was estimated to be:

- Velocity = 80 hours
    - Capstone 1 = 10 hrs x 2 = 20 hrs
    - Capstone 2 = 20 hrs x 3 = 60 hrs

Sprint User Stories:

- User Story 1 - Review previous teams code:
    - Obtain the code written by the previous team and review what is written.

- User Story 2 - Review Arduino basics:
    - Review the basics of Arduino in order to understand the code written by the previous team.

Sprint 2

Date: 5/16/2022
Meeting Time: 1 Hour

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After discussion, the velocity of the team was estimated to be:

- Velocity = 80 hours
    - Capstone 1 = 10 hrs x 2 = 20 hrs
    - Capstone 2 = 20 hrs x 3 = 60 hrs

Sprint User Stories:

- User Story 1 - Implement previous teams design:
    - Replicate the design presented in the previous groups work

- User Story 2 - Research different display types:
    - Look for a different display monitor that would better serve the project

- User Story 3 - Update design:
    - Look for a more compact solution.

Sprint 3

Date: 6/13/2022
Meeting Time: 1 Hour

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After discussion, the velocity of the team was estimated to be:

- Velocity = 80 hours
    - Capstone 1 = 10 hrs x 2 = 20 hrs
    - Capstone 2 = 20 hrs x 3 = 60 hrs

Sprint User Stories:

- User Story 1 - Assembling the Arduino
    - Assemble the Arduino hardware.

- User Story 2 - Minimize the size of the device
    - Get the device as small as possible.

- User Story 3 - Meet over UI plans
    - Have a meeting to see what are plans for the ui want to be.

- User Story 4 - Improve the UI of the program
    - Make the UI more user friendly, as indicated by the product owner.

- User Story 5 - More arduino
    - Get more arduinos to more members to effectively work on the product more cohesively.

- User Story 6 - Continue researching different display types
    - Continue looking for a different display monitor that would better serve the project.

- User Story 7 - Front/back end
    - Have different groups for front and back end tasks onto the device.

Sprint 4

Date: 6/27/2022
Meeting Time: 1 Hour

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After discussion, the velocity of the team was estimated to be:

- Velocity = 80 hours
    - Capstone 1 = 10 hrs x 2 = 20 hrs
    - Capstone 2 = 20 hrs x 3 = 60 hrs

Sprint User Stories:

- User Story 1 - Assembling the Arduino
    - Assemble the Arduino hardware.

- User Story 2 - minimize the size of the device
    - Get the device as small as possible.

- User Story 3 - Meet over UI plans
    - Have a meeting to see what are plans for the ui want to be.

- User Story 4 - Improve the UI of the program
    - Make the UI more user friendly, as indicated by the product owner.

    - User Story 5 - More arduino
        - Description - Get more arduinos to more members to effectively work on the product more cohesively

- User Story 6 - Continue researching different display types
    - Description - Continue looking for a different display monitor that would better serve the project

- User Story 7 - Front/back end
    - Description - Have different groups for front and back end tasks onto the device

Sprint 5

Date: 7/11/2022
Meeting Time: 1 Hour

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After discussion, the velocity of the team was estimated to be:

- Velocity = 80 hours
    - Capstone 1 = 10 hrs x 2 = 20 hrs
    - Capstone 2 = 20 hrs x 3 = 60 hrs

Sprint User Stories:

- User Story 1 - Assembling the Arduino
    - Assemble the arduino hardware

- User Story 2 - minimize the size of the device
    - Get the device as small as possible

- User Story 3 - Meet over UI plans
    - Have a meeting to see what are plans for the ui want to be

- User Story 4 - Improve the UI of the program
    - Make the UI more user friendly, as indicated by the product owner

- User Story 5 - More arduino
    - Get more arduinos to more members to effectively work on the product more cohesively

- User Story 6 - Continue researching different display types
    - Continue looking for a different display monitor that would better serve the project

- User Story 7 - Front/back end
    - Have different groups for front and back end tasks onto the device

- User Story 8 - Look into using Bluetooth instead of a display
    - Make use of Bluetooth to display output

System Design

This section contains information on the design decisions that went into this project. The architecture patterns are outlined and explained. The entire system is shown in a UML diagram and how it operates.

- The arduino takes information from the sensors and sends information back to the sensors to calibrate to obtain the “perfect” rep.
- The sensors send back the information to the arduino and simultaneously the arduino outputs the visual onto the monitor to show you how far your current form is away from the “perfect rep”.

System Validation

Device Tests

- UI shows up onto the monitor.

- Device correctly outputs the current information onto the monitor and displays the balancing sensors and calibrates on the fly with any sort of motion.

GLOSSARY

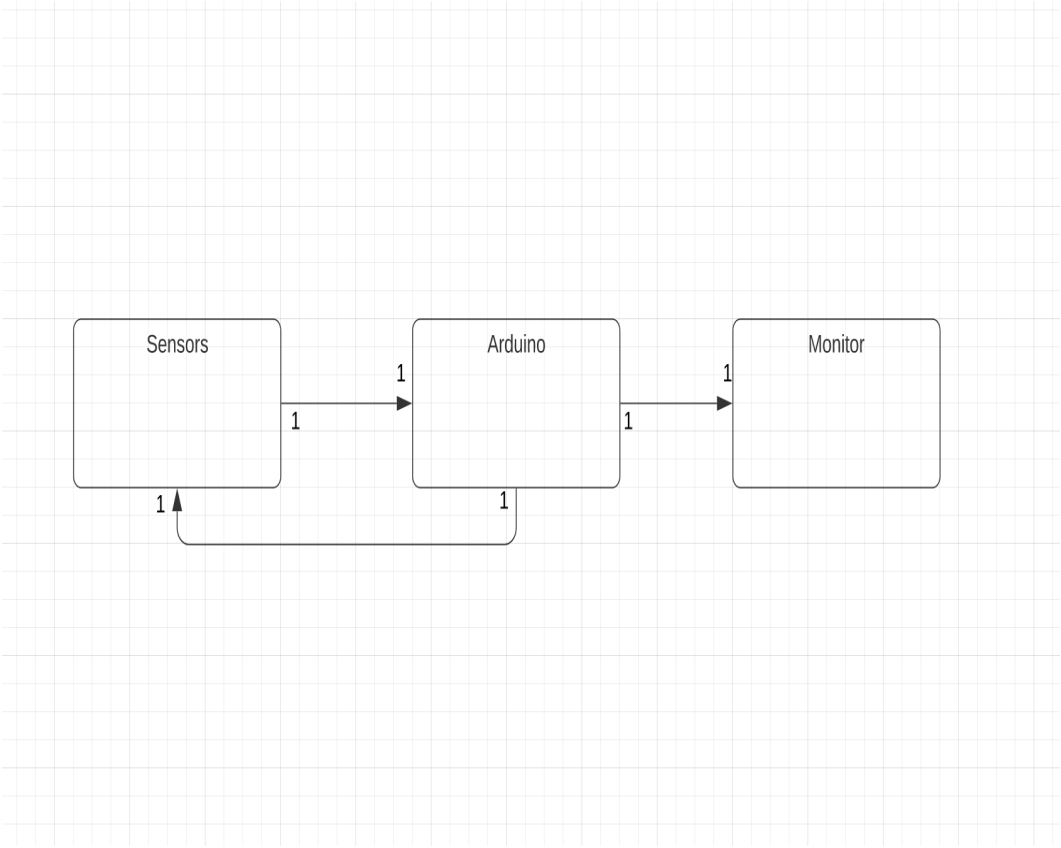
- **Perfect Rep**: The “perfect” form that has been studied over the years that gives you the optimal form and gives you the best outcome possible when exercising.

- **UI**: User Interface. What the user sees outputted onto the monitor. It displays the sensor's balancing and shows how far away your current form is away from the “perfect” form.

- **Balancing Sensors**: Sensors in the device that are preset to the “perfect” rep. Calibrates on the fly and displays information onto the monitor.

APPENDIX

Appendix A - UML Diagram



Appendix B - Sprint Review Meeting Reports

Sprint 1

Date: 5/29/2022
Start Time: 1:30 pm
End Time: 2:00 pm

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:

User Story 1 - Review previous team's code:

- Obtain the code written by the previous team and review what is written.

User Story 2 - Review Arduino basics:

- Review the basics of Arduino in order to understand the code written by the previous team.

Sprint 2

Date: 6/12/2022
Start Time: 1:30 pm
End Time: 2:00 pm

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:

User Story 1 - Implement previous teams design:

- Replicate the design presented in the previous group's work.

User Story 2 - Research different display types:

- Look for a different display monitor that would better serve the project.

User Story 3 - Update design:

- Look for a more compact UI.

Sprint 3

Date: 6/26/2022
Start Time: 1:30 pm
End Time: 2:00 pm

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:

User Story 1 - Assembling the Arduino :

- Assemble the Arduino hardware.

User Story 2 - Minimize the size of the device:

- Make the device as small as possible.

User Story 3 - Meet over UI plans:

- Have a meeting to see what the plans for the UI are going to be.

User Story 4 - Improve the UI of the program:

- Make the UI more user friendly, as indicated by the product owner.

User Story 5 - More Arduino:

- Get more arduinos to more members to effectively work on the product more cohesively.

User Story 6 - Continue researching different display types:

- Continue looking for a different display monitor that would better serve the project.

User Story 7 - Front/back end:

- Have different groups for front and back end tasks onto the device.

Sprint 4

Date: 7/10/2022
Start Time: 1:30 pm
End Time: 2:00 pm

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:

User Story 1 - Assembling the arduino:

- Assemble the arduino hardware.

User Story 2 - Minimize the size of the device:

- Make the device as small as possible.

User Story 3 - Meet over UI plans:

- Have a meeting to see what the plans for the UI are going to be.

User Story 4 - Improve the UI of the program:

- Make the UI more user friendly, as indicated by the product owner.

User Story 5 - More arduino:

- Get more arduinos to more members to effectively work on the product more cohesively.

User Story 6 - Continue researching different display types:

- Continue looking for a different display monitor that would better serve the project.

User Story 7 - Front/back end:

- Have different groups for front and back end tasks onto the device.

User Story 8 - Look into using Bluetooth instead of a display:

- Make use of Bluetooth to display output.

Sprint 5

Date: 7/24/2022
Start Time: 1:30 pm
End Time: 2:00 pm

Attendees: Christopher Puglisi, Jose Fernandez, Jorge Jaime-Hernandez, Alejandro Cores, Luis Artimez

Product Owner: Michael Bucar (mhb10s@aol.com)

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners:

- **User Story 1 - Finishing final deliverables/posters/video presentation/powerpoint**

- Assigned to Capstone II Students

- **User Story 2 - Finishing final deliverables and Capstone I poster**
  - Assigned to Capstone I Students

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