Software Requirements Specification

ORGANIZATION	
PROJECT NAME	The Slow-Pitch Automated Review Calculation (SLOW-ARC) system
AUTHOR	Shiva Cheruvu, Roshan Gokul, Maurice Yu, Eric Liu

OVERVIEW

The Slow-Pitch Automated Review Calculation (SLOW-ARC) system uses just threes camera to aid in making determinations about whether an individual pitch is a strike or a ball in slowpitch games. This low threshold for equipment drastically reduces the cost to organizations, dropping the cost to hundreds of dollars per installation, instead of hundreds of thousands.

TECHNICAL REQUIREMENTS

FUNCTIONAL REQUIREMENTS

ID	DESCRIPTION	Inputs	Outputs	Source	Use Case	Authors
1. Pitch Evaluatiuon	The System shall determine whether a pitch is a ball or strike by decide whether the pitch pass through the strike zone or not. If any portion of the pitch passed through any part of the strike zone, it's considered a strike, otherwise it is considered a ball. 1.1: A strike zone is defined under Rule 1 of the 2023 USA Softball Official Rulebook.	None	None	2023 usa softball rule book	Determination	Eric Liu
2. Batter and Strike Zone	If the ball goes through the strike zone defined under Rule 1 of the 2023 USA Softball Official Rulebook then the system shall determine the pitch as a strike otherwise the system shall determine it as a ball.	Senser	Determination	2023 usa softball rule book	Determination	Maurice Yu
3. Accuracy	The system shall determine balls and strikes with at least a 90% accuracy rate	output	acceptance	user feedback	reporting system	Maurice Yu
4. Integration	The system shall receive the data sent by three cameras placed on the field, and use these data to determine whether a pitch is a ball or strike. 4.1: The camara setup should follow requirement 5: Camera Setup. 4.2: The determinnation standard should follow requirements 2: Batter and Strike Zone and 1: Pitch Evaluatiuon.	pictures taken by the cameras	Determination	user feedback	Determination	Eric Liu
5.A Camera Setup	The camera setup will be capable of capturing data and output data of pitches during softball games in multiple forms of media.	Media and Determination	Determination	User need/feedback	Determination	Shiva Cheruvu
5.B Camera Setup	The system shall be able to track the x and y axis trajectory of the ball from the release of the pitch till the end of the current pitch. The system will be able to capture data that is distinguishable to the rules of USA softball calls of strikes and balls.	Media and Determination	Determination	Enviornments Factors	Determination	Shiva Cheruvu

REPORTING AND USER CONTROL REQUIREMENTS

ID	DESCRIPTION	Inputs	Outputs	Source	Use Case	Authors
6. Reporting	The system shall report the results of the pitch evaluation and number of runs in the form of light signals corresponding to a de	Determination	User Control	User Feedback	Reporting	Roshan G
7. User Control	The system shall allow user input from officials in the case the data from the camera is compromised	Reporting	User Control	User Feedback	User Control	Roshan G
9. User Control	The system shall provide live feedback to the umpire to have the ability to keep track of a multitude of games	Determination	User Control	User Feedback	User Control	Roshan G

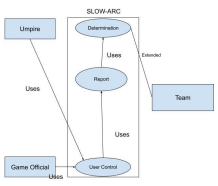
Use Cases

(1)Determining System- The Camera Setup, part of the Determining System, involves configuring and positioning cameras to capture footage of the softball game. This system determines the optimal camera angles, positions, and settings to ensure accurate and comprehensive coverage of the game. It may include selecting the number and type of cameras, their placement around the field, and their settings for capturing clear images of the pitch, batter, and strike zone.Pitch Detection is a critical function within the Determining System. It involves the recognition and tracking of the softball as it is pitched from the pitcher to the batter.This process is to accurately detect and follow the trajectory of the softball, ensuring precise pitch data for analysis.The Batter and Strike Zone component within the Determining System focuses on tracking the batter's movements and defining the strike zone accurately. It uses technology or sensors to monitor the batter's position and the dimensions of the strike zone, ensuring that umpires and the reporting system have the correct information to make accurate calls during the game.

(2) Reporting System-The Pitch Evaluation component of the Reporting System analyzes the data collected from the Determining System to assess the quality of each pitch. It may consider factors like pitch speed, trajectory, and location relative to the strike zone. This evaluation helps umpires, coaches, and players make informed decisions and provides valuable insights for post-game analysis. he Accuracy Requirements in the Reporting System establish the desired level of precision for the data generated by the system. This component sets the standards for how accurately pitch data, batter statistics, and strike zone information must be recorded and reported. It ensures that the system meets the needs of both game officials and those analyzing the game data. Integration is a crucial aspect of the Reporting System, as it involves connecting and sharing data with various stakeholders. This component ensures that pitch data, batter performance metrics, and other game information are seamlessly integrated with scoreboards, broadcast graphics, and other systems to provide real-time updates to fans, coaches, and players.

(3) User Control System- The User Control System empowers users, such as umpires and game officials, with tools and interfaces to interact with and control the camera reporting system. This may include options to review plays, change camera angles, check data from previous games/plays, or access specific pitch data for decision-making. User Control ensures that those overseeing the game have the ability to manage and customize the system to meet their needs.

Use Case Name	Summary	Basic Course of Events	Alternative Paths	Exception Paths	Trigger	Precondition	Postcondition	Author	Date
Determination	The system generate a determination after a pitch.	1. Three cameras take pitcures of a pitch. 2. The system generate a determination based on pictures taken in step 1.	None	In step 1, if one of the cameras are malfunctioned, use pictures taken by the rest two cameras instead. If two of more cameras are malfunctioned, generate a error result.	A pitch is made.	A pitch is made.	A determination (ball/strike) is generated.	Eric Liu	10/3/2023
User Control	The system lets the user interact with the pitch by replaying it and accessing the determination post pitch.	1. The report is documented 2. The user then views the data 3. The user can then access the determination to change tools, camera	None	If there is an error result from the determination, allow for manual input into the user control system	User wants to analyze data	User wants to analyze data	The report is properly made with no error result	Roshan Gokul	10/4/2023
Reporting	The system reports to the user the determination of the pitch.	1. The determination is made 2. The signal is sent to the reporting system 3. The signal then registers inside a database or the user	None	The exception is made when the signal is sent but the functioning machinery that alerts the user might be invalid to take the response or not in condition to	A determination is made	A determination is made	The user is alerted of the determination	Shiva Cheruvu	10/3/2023



Assumptions

Environment won't affect the system
User always use the system correctly
No illegal pitches

Specifications

Camera Setup:
Select the number and type of cameras based on the coverage area.
Determine camera placement around the field to capture key game elements.
Set camera parameters (e.g., focus, exposure) for clear image capture of the pitch, batter, and strike zone.

Pitch Detection:
Objective: To recognize and track the softball's trajectory as it is pitched.
Tasks:
Employ technology (e.g., radar, computer vision) for accurate softball detection.
Continuously track the softball's movement from the pitcher to the batter.
Ensure precise pitch data is collected for later analysis.

Batter and Strike Zone:

Objective: To track the batter's movements and define the strike zone accurately.
Tasks:
Utilize sensors or technology to monitor the batter's position.
Measure the dimensions of the strike zone for precise information.
Ensure that umpires and the reporting system have accurate data for making calls during the game.

Pitch Evaluation:

Objective: To assess the quality of each pitch using collected data.
Tasks:
Analyze factors like pitch speed, trajectory, and location relative to the strike zone.
Generate evaluations that assist umpires, coaches, and players in decision-making.
Provide insights for post-game analysis and player improvement.

Accuracy Requirements:

Objective: To establish precision standards for recorded and reported data.
Tasks:
Define accuracy requirements for pitch data, batter statistics, and strike zone information.
Ensure that data meets the needs of game officials and analysts.
Establish clear guidelines to maintain data integrity.

Integration: