**Project Management Plan**

**Autonomous Referee - AutoRef**

**Professional Doctorate in Engineering**

**2022 Mechatronic Systems Design team**

**Department of Mathematics and Computer Science**

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# **Introduction**

This project is about designing an Autonomous Referee. The Autonomous Referee is an intelligent system designed to help human referee in soccer robot games, thereby enhancing the reliability and credibility of the decision-making process. Developed by the Eindhoven University of Technology for the RoboCup Middle Size League(MSL), this system leverages cutting-edge technologies including computer vision, Machine Learning, and robotics to enable autonomous monitoring and management of soccer games. By integrating these technologies, the system can perform a wide range of functions such as tracking the ball position, detecting fouls, and signaling when the ball crosses the goal line. Such capabilities are expected to significantly reduce the potential for human error and ensure a more accurate and consistent refereeing experience.

# **Project Management Framework**

Elham Honarvar, the project manager, is in charge of managing and carrying out this project in accordance with the Project Plan. Jira is the project management and planning software which will be used for assigning the tasks to the group members and evaluate the progress of the project tasks.

The project management framework is based on the Project Management Institute’s(PMI) Project Management Body of Knowledge (PMBOK).

# **Project Life Cycle Model**

The Agile iteration approach will be used to guide the development procedure from requirement engineering until the system validation. There will be daily meetings for team which is scheduled in an excel file and weekly meetings with stakeholders will be discussed orally during each meeting based on their availability and the invitation will be sent through Microsoft Teams.

For each phase of the project life cycle, a presentation will be provided and discussed with the stakeholders during weekly meetings, and any possible changes will be updated in the next presentation, which will be finalized and documented after their approval.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| * Stakeholder’s Registration * Needs and Requirements gathering from stakeholders * Requirements Registration | * Define scope and goal of the project * Assign timeframe and resources * Understand dependencies and constraints * Develop a detailed plan for the design and implementation * Define the system architecture * Identifies the hardware and software needed for the desired functionality of Auto-ref * Assign responsibilities to team members * Risk registered * Define a communication plan for weekly meetings with stakeholders * Updating Requirements | * Implementing the system architecture and design * Documenting the system’s configuration * Documenting system’s architecture * Integration of hardware and software | * Deployment of the system in the intended environment * Validation and Testing the system * Analyzing the system’s performance with respect to time and accuracy | * Delivery of the project * Final documentation * Final Project Report |

# **Registration**

All the documents regarding registration can be found in the project folder in Auto-Referee GitHub named “Auto-Ref files and documents (MSD 2022)”.

## **Stakeholder’s Registration**

Stake holder’s are registered based on their responsibility, power and interest. The stakeholders ‘registration can be find in the project folder.

## **Team’s Registration**

The project team consists of MSD trainees all responsible for technical design but there are some extra roles that each member will be responsible for that. The team registration excel find is located in the project folder.

## **Project schedule registration**

To effectively manage the AutoRef Project, a project schedule will be developed using MS Excel. This schedule will be based on the project's Work Breakdown Structure (WBS) and will identify the main deliverables as well as the specific work packages required to complete each deliverable. The project is scheduled to commence on February 6th and will conclude on March 23th. Throughout the project, several key activities will be undertaken, including the development of project requirements, design and development of the AutoRef system, and testing and deployment of the system. By utilizing a detailed project schedule, the AutoRef Project team can ensure that all tasks are completed on time and within budget, ultimately leading to a successful project outcome.

## **Requirement Registration**

Requirements will be discussed orally during weekly meetings with stakeholders. The final decision regarding approving the requirements will be made by all team members according to their scope (measurable and testable) and consistency. Furthermore, all requirements must be approved by stakeholders during weekly meetings. All requirements will be recorded and tracked in the document entitled “Requirement Registration”.

## **Change Registration**

Any possible change regarding requirements, design method or solution will be discussed during weekly meeting with stakeholders and after approval it will be registered by project manager in an excel file that can be found in the project folder.

## **Deliverables Registration**

All the deliverables documents and software will be registered in deliverable registration file and will be placed in Auto-Referee GitHub.

## **Risk Registration**

All the risks involved in the design project is documented in an excel file named risk registration. After the project manager has given the permission, the quality and test expert will record the risks.

# **Collect stakeholder’s need and requirements**

The definition of the project's goals and objectives is the first step in gathering requirements. All previous MSD groups' requirements will be used, and new requirements and user needs will be gathered through scheduled meetings with stakeholders and brainstorming sessions with all group members. The requirements will be registered in the Requirements registration file once they have been approved.

All members of the group will agree on the decision-making technique that will be used to collect requirements.

# **The scope and goal of the project**

The 2022 MSD AutoRef project includes the planning, design, development, and testing of an autonomous referee for robot soccer. The project will be completed when the software and all documentation packages have been successfully executed and approved by the stakeholders.

Due the time restriction and number of group members the project scope is limited to:

* Detect any violation occurring when starting the game with a corner kick within 1 second with at least 85% accuracy
* The game states that needs to be detected are:
* The positions of soccer robots for each delta-T relative to the coordinate system
* Positions of the lines that defines the field relative to the coordinate system
* The position of the ball

The system at the abstraction level and detailed scope will be provided in “System Architect” document that will be located in project folder.

# **System Architect**

The architecture description is a document that includes details on the stakeholders, the system environment, their concerns, and the architecture model that takes those concerns into account. This paper must be supplied by the team's system architect. The project folder and GitHub account for this project will contain the final edition of this document.

# **Design**

The software will be designed by the entire team. To select a design solution, the team will conduct a feasibility analysis using all available resources. Python will be used to develop AutoRef algorithm. All code implemented will be saved in the Github repository for organizational purposes and future implementations.

# **Project milestones:**

The following phases depicts the major milestones planned for the Autoref project. The project manager will notify the project team of any approved changes to this list.

Phase1) Finalize the Requirements

Phase2) Select and finalize the design solution

Phase3) Software development and testing

Phase 4) Deliverables documents

# **Project schedule**

MS Excel will be used to create a project schedule for the AutoRef project with the mentioned deadline for each task. This schedule is registered in project schedule registration file. The project manager will notify the project team of any approved changes to the schedule.

# **11. Resource Requirements**

The following resources are required for this project:

* Hardware resources such as cameras, sensors and the robots
* A team of design engineers, robotics and domain experts for validation of the software
* Software resource such as programming languages, development tools
* Testing and validation environment

# **12. Project Deliverables**

The deliverables of the project are:

* All the registered documents
* Project Management Plan
* A GitHub including the developed software and a detailed report that includes system design, implementation details, testing results, and performance evaluation.

# **13. Communication Management Plan**

The Project Manager will take the lead role in ensuring effective communications on this project. All weekly meetings will be orally discussed with stakeholders based on the availability of all members and key stakeholders. The daily meetings with team members will be held in accordance with the agreement reached with all team members. The communications requirements are documented in the Communications Matrix below.

The Communications Matrix will be used as the guide for what information to communicate, who is to do the communicating, when to communicate it, and to whom to communicate.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Communication Type** | **Description** | **Frequency** | **Format** | **Participants/ Distribution** | **Owner** | **Tools** |
| Weekly Status Report and Technical Design Review | Weekly meeting with stakeholders to present the status of the project and technical consultation | Weekly | In person | Team members and Stakeholders | project manager and team leader | Microsoft Teams, Microsoft Office |
| Daily Project Team Meeting | Meeting to review action register and status | Daily | In Person | Team | Project manager, team leader | Microsoft Teams’ channel |
| Weekly Project Team Meeting | Sprint planning | Weekly | In person | Team | Project manager | Jira  Microsoft Teams |

# **14. Risk Management Plan**

The risk management strategy for the Autoref Project involves a systematic approach where the project team identifies, evaluates, and prioritizes different risks. The team will strive to anticipate risks in advance to develop a mitigation plan from the beginning of the project and even during the design phase for any possible risk according to our solution method. The risks that are deemed most probable and have the highest potential impact will be incorporated into the project timeline to ensure that the team takes the necessary actions to implement the mitigation strategy at the appropriate time. A "Risk Register" document will be used to document all identified risks.

# **Conclusion**

The Autonomous Referee for Soccer Robot project is an innovative project that aims to create an intelligent system that can help human referee in managing the soccer games played by robots. The project has a clear objective,, and deliverables. The project timeline is intense. By managing the risks and following the project plan, we can successfully complete the project within the given time and available resources.