

Project Proposal: Mixed Reality Tabletop War Game Assistant

COMP3003

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BSc Computer Science

1 Motivation and Background

1.1 Introduction

Tabletop Wargaming is a popular hobby but, with a high barrier to entry, it remains niche and inaccessible to many. The rules to tabletop wargames can be complex and difficult to learn. This can be daunting for new players putting them off the hobby as well as causing arguments between seasoned players over different rules interpretations.

The most popular wargaming systems are produced by *Games Workshop* [1]. One of their more popular systems, *Warhammer 40k*, has a core rulebook of 60 pages [2] and the simplified version of another game system, *Kill Team*, is a rather dense three page spread [3].

Video games help on-board new players by having the rules of the game enforced by the game itself. This project aims to bring this experience to tabletop wargaming, specifically the *Kill Team lite* [3] system. This is because the *Kill Team Lite* rules are publically available from *Games Workshop's* website and it is designed to be played on a smaller scale to other wargames, making it a good candidate for a proof of concept.

1.2 Relevent Past Work

Previous attempts at digitising the state of a tabletop wargame have been made utilising RFID tags on models with an antenna grid beneath the table to triangulate the position of each tag [4].

This approach works well to calculate the rough position of larger models with multiple RFID tags but smaller models with only one tag can prove difficult. This is because, using consumer grade electronics, finding the signal strength from an RFID tag to a receiver is often not supported or is inconsistent due to reflections, interference etc [4]. As a result, the only information you can gather is whether a tag is in range of a receiver. Using this method with a single tag you can only find the rough area of a model by comparing the overlapping ranges of multiple recievers [4].

1.3 Project Overview

Kill Team, being a smaller scale game, only makes use of the smaller models. So an RFID approach would not be useful in tracking it's exact location. This is needed to calculate the distance it can move and what other models are visible.

As a solution to this problem I want to use *OpenCV* [5] to interpret the state of the physical game board. Miniture models are typically placed on top of small, circular, black bases. To detect each model I plan to produce rings to go around these bases made of high contrast colours to allow a camera placed above the board to look for these rings and display the models position on a top down virtual board.

Wargames often use terrain to provide cover for models. I plan to use pre-set terrain pieces where I have stored the corresponding dimensions of each piece. To detect these pieces of terrain I plan to put AR tags [6] on the top of each piece. This would then allow me to accurately display the terrain on the virtual board and calculate the cover provided by each piece.

One downside of my approach is that calculating verticality within the game would be difficult to do. To solve this problem I plan to implement a gametype of *Kill Team Lite* called *Gallowdark*. This terrain type is played on a flat board with no verticality.

2 Aims and Objectives

My aim in this project is to develop a system to produce a digital representation of a physical tabletop wargame. Then, using this representation, I aim to automate the rules of the game to provide a more accessible experience for new players.

3 Project Plan

4 Bibliography

- [1] Games Workshop, “Games workshop investor relations statement,” 2023. [Online]. Available: <https://investor.games-workshop.com/our-history>
- [2] Games Workshop, “Warhammer 40k core rules,” 2022. [Online]. Available: <https://www.warhammer-community.com/wp-content/uploads/2023/06/dLZlIatQJ3qOkGP7.pdf>
- [3] Games Workshop, “Kill team lite rules,” 2022. [Online]. Available: <https://www.warhammer-community.com/wp-content/uploads/2022/08/ekD0GG2pTHlYba0G.pdf>
- [4] Steve Hinske, and Marc Langheinrich, “An RFID-based infrastructure for automatically determining the position and orientation of game objects in tabletop games,” Jun. 5, 2007. [Online]. Available: <https://vs.inf.ethz.ch/publ/papers/hinske-pg07-rfidtabletop.pdf>
- [5] G. Bradski, *The OpenCV Library*, (2000). [Online]. Available: <https://github.com/opencv/opencv>
- [6] Ku Wee Kiat, “AR tags and their applications in computer vision tasks.” [Online]. Available: <https://nusit.nus.edu.sg/technus/ar-tags-and-their-applications-in-computer-vision-tasks/>