**TFTBot Project:**

**Analysis.**

The Problem.

Team-Fight Tactics, often abbreviated as T F T, is an auto-chess, strategy game, created by Riot Games and running on the engine same engine that powers the popular multiplayer online battle arena League of Legend. TFT is an incredibly complex, strategic game that requires a vast amount of game knowledge and experience. Getting skilled at TFT is a large time commitment and overall a slow process. One large hinderance is the lack a training or test mode resulting in the fact that the only way to improve at TFT is to play TFT. There is not a “test mode” for instance that allows you to create a team composition and battle it against a different one and so if you wanted to get experience with a certain team composition or item, you would have to hope you get the opportunity to play the team composition/ item, which is no guarantee, meaning you could waste a large amount of time unnecessarily trying to learn about a rare interaction. If Riot Games were to implement a custom or a test game mode, lots of time could be saved, leading to shortened learning time and quicker improvement at the video game. It would reduce the time commitment that new players need to improve at the game, allowing them to enjoy the game more than if they were left in the dark, as well as allowing experienced users to test out ideas without spending lots of time trying to get the opportunity to do so.

The Stakeholders and Solution.

Suket Arya is an avid TFT player. Within TFT, what Suket particularly enjoys is brainstorming and creating new ideas for team compositions and strategies to test out against other, more popular compositions. However, with his enrolment into university, he no longer has the time to spend multiple games attempting to get a favourable position to be able to test out a team composition, and then the numerous games after that to fine tune the strategy into something completely viable.

My solution is to create a program that can simulate a board/ battle between two team compositions accurately. Following on from this, through a UI, I aim to give the user the ability to place down units and teams, giving the opportunity to users to test out ideas and learn certain matchups, without having to try to recreate the situation in an actual game, which could be a very timely investment. Furthermore, it would give more effective, instant feedback and allow slight tweaking of a board so users could see what they could have done better, rerunning a similar battle multiple times to show them what they should have changed to win that battle in the future, allowing for faster learning and improvement for new players.

This tool aims to be useful for all TFT players, both those looking to scratch the itch of team building and strategic thinking, as well as those looking to improve quicker than their counterparts. Moreover, this tool will be useful at all levels of play, even for pro players who will enjoy the extra freedom it provides.

Existing Solutions:

There are no existing programs that allow for the simulation of TFT battles, however, as this aims to be an educational tool, I’ll compare this solution to what other educational tools out there for TFT.

***Community Guides:***

As with any community, there is lots of content surrounding educating and improving at the video game. Whilst these can be very useful and helpful, especially for a beginner with zero previous experience with the game, the quality of content within the guides can vary widely, from incredibly useful to downright misinformation and harmful to anyone trying to learn how to play the game. When trying to improve through community guides any user has to be careful to ensure the guide is positively reviewed or guarantee themselves that the content within the guide is accurate (which is near impossible for newer players).

Moreover, there is an upper bound for where community guides can continue to help you. Experienced and high level players will learn near to nothing from guides aimed at newer players and there becomes a level where community guides no longer cover a high enough skill level.

Finally, as the game progresses, any guide has to update itself or find itself becoming irrelevant as the new content invalidates the information in the older guide, users have to be careful to check that any content was posted fairly recently or has been updated.

Positives:

* Can be a great starting point and can help beginners avoid simple pitfalls they often fall into.
* Can help pass on guidance from more experienced players to newer ones.

Negatives:

* Can be outdated or low quality
  + Guides must be constantly updated or else they risk giving outdated, invalid or entirely useless advice about the game.
  + The user also must be able to discern the quality of the guide, or there have to be good mechanisms in place for reviewing guides, otherwise new players can be given bad advice without knowing better, severely hindering their ability to improve.
* May not cover an issue or skill that a player needs to learn.
* Only useful for new players or semi advanced players

Examples:

* Mobalytics:
  + Graphical user interface, text, application, email

    Description automatically generated
  + “Mobalytics” offers a starting tutorial/ guide for beginners, helpful so for your first few games you aren’t completely thrown in the deep end with no help, but beyond that provides zero guidance for more experienced players.
* Mobafire Community-Made Guide:
  + Text

    Description automatically generated
  + More in-depth community made guide available on “Mobafire”, offers some good tips, but is now very outdated, at almost two years old. However, it is still one of the top options that comes up if you search for a TFT guide, so newer players could fall victim thinking it was still solid, relevant advice.

***Meta-advice Programs:***

There are programs out there that run alongside TFT and offer guidance on currently strong teams and strategies in TFT. They provide overlays that show up in game and give you a list of compositions to choose from and then information on each composition. They can also contain other pieces of information such as what component items combine into and what these items do. These programs are useful for new players or more experienced ones who do not have time to keep up with the meta (stands for most effective tactics available, a community consensus on what teams are strong at the moment). More casual players generally find these types of programs very useful.

However, they only really provide information available from a google search in a more convenient and accessible place, one that isn’t constantly changing either, so more experienced players do not really have a use for them. They do not really teach the user anything either and sometimes mindlessly following what the program tells the user to do without thinking why can harm or halt their improvement.

Positives:

* Provides advice directly in the game
* Helps player stay up to date with the latest and most effective strategies known to the community at the time.

Negatives:

* Not adaptive
  + Provides no adaptive or specific advice to certain situations, simple informs you what strategies are popular at the time, no matter how viable that strategy is for you in that specific scenario.
* Only useful for new players or players completely out of touch with the meta (most effective tactics available).
* Can slow improvement.

Examples:

* Mobalytics App:
  + 
  + Mobalytics has an app you can install that offers in game advice as shown above. It allows you to select a team composition and gives you advice on where to place units, what items to go and what characters to get.
  + However, liked stated as you progress further, it gets less and less useful.
  + Can actively harm players if it is not the right opportunity to go a certain team composition you selected, choosing to ignore it meaning the program offers nothing in value, whereas forcing the composition when you shouldn’t (either because the user does not know better or otherwise) will harm your chances to win the game.

***Coaching:***

Coaching is always an effective option when looking to improve at the game. Regardless of skill level, as long as you don’t find yourself at the very very top of the rankings, there will always be someone to coach you.

Coaching is undoubtedly the best method to improve at TFT, offering direct and insightful advice which can vastly speed up the rate at which you improve. They can highlight what you are doing wrong and give you tips and knowledge which would have taken you hundreds of hours to learn. It cannot be overstated how useful coaches can be when trying to improve. This, however, is the reason why they can be so inaccessible. Unless you know someone personally good enough and willing to coach you, who also has a talent for teaching people, you will have to pay someone for the privilege, which can be incredibly expensive. A bad coach will also not provide much use, so users have to be careful to get a highly regarded coach to avoid wasting their money and time.

Positives:

* Provides useful, accurate advice.
* Specific to your situation, can tell you the optimum move in any scenario.
* Can provide helpful tips and knowledge.
* Helpful at every skill level

Negatives:

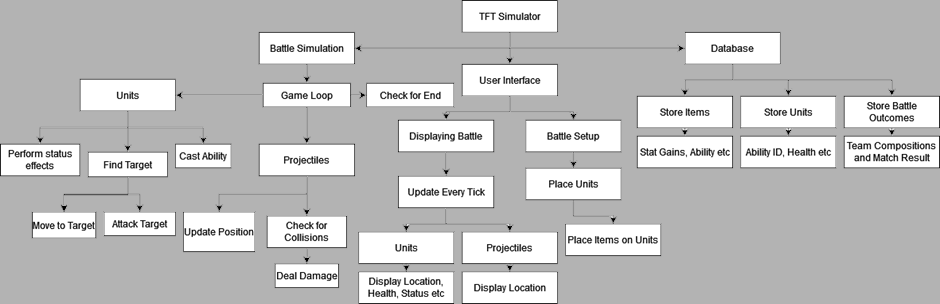
* Not accessible to everyone.
* Requires a large time commitment from the better player.
* Can buy paid coaching which can be very expensive.

Examples:

* A screenshot of a computer

  Description automatically generated with medium confidence
* Live coaching is an effective way to rank up from the very top of top players, and is effective at higher ranks when other methods offer less and less benefit as you go up in rank.
* The downside is that it is very expensive, having to spend lots of money for even a relatively short period of time coaching unless the user personally knows someone willing to coach them.

Need for Computational Methods.

The problem at hand is uniquely suited to being solved by a computational methodology. With my project, we can use decomposition, breaking a large problem down into many smaller parts, to split up the project in numerous ways. Units, status effects and items within the game can be represented with classes and a board class could run iteratively until the battle is over. Moreover, my program is suited for abstraction. The original TFT always utilises abstraction, however, in order to complete my program, I will need to recreate/ simulate certain parts of TFT, but by utilising abstraction, I can ignore certain aspects of the game that are irrelevant to my needs, such as the item shop and in-depth graphics they offer. I can also utilise abstraction to create a simplified graph/ breakdown of my project:

Diagram

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Features.

There are numerous features I consider key to the program, such as:

* Creating teams and battles through a user interface.
* Simulating battles rapidly and efficiently.
* Pausing a battle or going through it tick by tick.
* Looking at the state of the battle through the user interface.
* Should not require internet access and be cross platform.

The ability to create certain teams and battles is key to the core aim of being able to test certain strategies efficiently and without the hassle of a normal TFT game, a user interface is required to allow the user to iterate rapidly over multiple team compositions, meaning they can quickly test numerous teams, as Suket likes to rapidly tweak teams constantly to find the best composition.

Suket only brought a low processing power laptop to university, so battles should be simulated rapidly and efficiently so that even users on computers like his can use the program without issues. The code should aim to be as efficient as possible and in a fast programming language to accommodate for this.

The program should allow the user to pause the battle or iterate through it tick by tick/ at a slower rate so the user can understand what is occurring in the battle on a deeper level without a result just being broadcast to them, simultaneously the battle should be visible through the user interface so the user doesn’t have to go through the additional effort of visualising the battle in their head, simplifying the process and ensuring they understand what is occurring.

Finally, the program should not require internet access, so users can still strategize and brainstorm while they would not usually be able to access TFT. Internet connection at Suket Arya’s accommodation as university is unstable at best as well, so the program should not require internet access to ensure he can access the program at all times. Moreover, while Suket’s laptop is a Windows device, his home computer is a Mac, so my solution has to be cross platform to allow him to access the program on either device.

Limitations.

There are a few limitations of the program and my development of the program. For starters, I have limited time and resources to pour into the project, which is accentuated by a lack of long term experience in programming and Rust in particular. The desired and full implementation of planned features may not be possible due to time constraints, especially as a set amount of time will have to be dedicated to working my way out of bugs/ pitfalls that more experienced programmers have seen before and know how to avoid.

A lack of money and resources will also holds the project back, as with more money a graphics designer could be hired to create the user interface, something I do not have much experience with. Any user interface I create would pale in comparison to something created by a professional and the presentation may risk driving away users who expect higher quality.

TFT itself is developed by an entire team of experienced developers and so perfectly replicating the game and keeping it constantly updated may be near impossible due to the sheer amount of time it would take, even if my abstraction means I can ignore aspects such as animations and graphics. Finetuning the exact stats of a champion or the interactions between numerous abilities will also be too timely, especially when it can be very hard to recreate certain situations in games to see what occurs, so there may be some discrepancies between TFT and the simulation.

While users will be able to edit/ add their own units with specific stats (so users can assist in keeping the simulation accurate), unique abilities for each character will not be able to be implemented by the any users, due to the fact that abilities are more often than not very complex, requiring multiple lines of code (that users would not be able to write or insert into the program) rather than a simple variable change, so users will have to use one of the abilities provided when editing units.

Unlike other educational methods that give direct feedback or advice, users of this program will be required to assess what went well or poorly in a battle, meaning it may be less useful for newer players, although the program will be useful for new players to get a feel for battles and units in TFT. Moreover, another limitation is that my program won’t cover parts of the game such as the economy or carousel so users will have go elsewhere to educate themselves on those sections of the game.

Finally, while the TFT simulation will be able to move forward through a battle at any rate, as it will not store previous ticks/ iterations in the game loop, moving backwards through the loop to rewatch things will not be possible, which may be an issue if users want to check how something occurred or for searching for bugs.

Hardware.

(Minimum) hardware requirements for the finalised program will be low:

* 1GB (spare) RAM.
* 1GB (available) local storage.
* 1.5 Ghz processor.
* Capable of running Windows 8 (or newer), Linux or MacOS.
* A GPU on par or more powerful than:
  + NVidia: GeForce 560
  + AMD: Radeon HD 6950
  + Intel: Intel UHD

Software required for the program is one of the Windows, Linux or MacOS operating systems.

Requirements:

These are the requirements for the program to be considered a success:

Simulation Requirements:

* All items from TFT are implemented.
* At least 3 units from TFT are implemented.

**Design.**

Breaking down the Problem.

*Draw.io Diagram*

