AI Village

University of Victoria Computer Science May 22, 2019

Project Proposal & 2 Week Summary

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2019

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# Project Proposal

## Preface

Hello, I am Tariq Chatur. As of this Directed Studies program, I will be hopefully obtaining my final credits of my undergraduate. Before attending to the details of the project and academic subjects that will be covered through this project, I would like to first thank those who have given me the opportunity to both study the topics that interest me the most, while also creating something that will hopefully change the world. Maybe changing the world is a tall order, but maybe after this semester, I can convince you that what is being done has the potential to do just that.

However, the semester has just begun. To start, the nature of this topic should be addressed. AI Village, which will be defined further into this paper, relies on the understanding of social beings, their behaviour, deep learning, multi-agent reinforcement learning, zoology, and much more. Because of this, much of the knowledge has to be obtained. This was the goal of the first two weeks of this project. However, as I have now realised, relying on the response times and whether they will ever respond leaves too much waiting time. So while the waiting time increases, I shall in parallel continue to improve simulation. However, I do estimate that once I have reached the limits of my own knowledge, progress may slow.

However, I will make sure that every 2 weeks there is enough new information to share and implement into the system such that by the end of this semester, you, I, and anyone else who is patient enough to read my writing will leave with a greater understanding of both the world itself and hopefully also the potential of what lies before them.

## Introduction

What is AI Village? AI Village is a simulation of social creatures using artificial intelligence through multi-agent deep reinforcement learning in a closed environment. AI Village is an opportunity test the capability of community simulation from an individual scale. Through the development of this project, the topics of 2D graphics, zoology, behavioural psychology, and artificial intelligence will all be combined.

## Project Background

Let’s break down AI Village definition mentioned earlier. Social Creatures are animals that survive by working with one another, also known as gregarious creatures.

Artificial Intelligence is a very broad topic that simply means a system that replicates thinking. To do this, our system will use a process called multi-agent deep reinforcement learning. Multi-agent in this respect means that there will be more than one AI interacting with the learning process. The “deep” keyword here means that it will use a neural network for each of the AI. Reinforcement Learning is the process of giving positive feedback when an agent that brings it closer to a goal, and provides negative feedback in the case of failure or harmful actions.

This will all be done in an initialized environment. Closed means that the environment won’t have any interactions or influences from outside of the system.

## Project Significance

Why should this project be completed? Currently AI is in a new wave of popularity in the Computer Science field as Deep Learning has become a viable tool with the recent improvements in computing power. This research acts as a method to test whether communities can be simulated through agents designed to replicate social beings. Currently many fields of research rely on primitive simulations, or real life. In real life the greatest restriction is time, and primitive simulations are used to replicate results instead of developing new ones. These fields could benefit heavily from having access to realistic social simulations.

## Statement of Purpose

If successful a combination of genetic algorithms, and AI teaching other AI could be used to quickly optimize agents to accomplish complex tasks that cannot be supervised. In the case of AI Village, the goal is to simulate a community in a closed environment. In addition, implementation of interaction would allow for testing of community behaviour could improve through the accelerated timesteps of AI Village. By seeing the quality of these simulations, further enhancement could lead to faster learning, research, and a higher understanding of AI behaviour.

## Research Questions

* Can a community be replicated through multi-agent social based AI?
* Can AI teach one another to optimise personal satisfaction?
* Will social behaviour be replicated by only setting biological responses?

## Hypothesis

Reinforcement Learning uses the same methods of training as one would a cat with a spray bottle, or a dog with a treat. Through this learning type and the inherit benefits of working with one another, as we can see through human development, the simulation should be able to replicate basic social behaviour at a simple stage. As a structural stand point expansion will be possible.

# Week 1 & 2 Summary

## Week 1

### Research

The first week in research was focused on finding people who could help in learning about human behaviour. The first was my brother who is a Masters student in Psychology. From there I was redirected to a few other professors and students. Collecting contacts, I realised that the wait time between people was taking too long. In parallel I learned how to create a simple 2D environment with the Python Library PyGame.

### Implementation

The first week of implementation was mostly tests using a basic tutorial online. It was through this that I learned how to make a grid and how to make characters move around.

## Week 2

### Research

Research was quite slow as I was passed between people. Most of which were either not confident in their ability to provide the necessary information or were currently away from work and unable to help, I used this time to learn more about PyGame and basic Psychology

### Implementation

Created the basic template of what will be the project. Created character control, the grid, UI Space, Resource Tiles, Agents that rely on resources, cleaned the code from before and added comments on all the components of code