The Simulation of Life and Decision Making using Artificial Intelligence and Unity by

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The Simulation of Life and Decision Making using Artificial Intelligence and Unity

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THE SIMULATION OF LIFE AND DECISION MAKING USING ARTIFICIAL INTELLIGENCE AND UNITY

Advisor: Dr. John Sullins

Since I was a kid playing video games, I've wondered if video games are able to replicate real life. Years later, I've come back to challenge my theory that video games can be made realistic with enough time and dedication to the research and how to properly implement it. In order to determine this, research must be done in numerous areas regarding life complexity. When people make decisions consciously they probably don't realize how much interpreting their brain is doing even for a single decision. People often associate intelligence as one thing, however there are several intelligences that must be taken into account. Motivation and life goals can shape a life in order to meet those goals and therefore the person can become satisfied with their life. Mood also plays an important position in determining what decisions are made at the moment. A happy person is more likely to commit their time to activities that meet their goals. Most of these decisions occur in our free time. On average people spend 40-50% of their day in free time. A person who is Highly motivated is likely to chase their goals regardless of the obstacles. Whereas someone less motivated will make more decisions based on current conditions and not their life goals. These are some of the main components that are involved in our daily lives and decisions. With this research and the ability of Unity and C# I created a realistic virtual simulation.

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1 Introduction

Video games are becoming increasingly realistic as time goes on. While growing up, I would often critique a game on how realistic it was. I always knew that a game could become very realistic and be very life-like if done right. Now, years later, I am questioning my theory. Can a video game realistically represent life? What are the main determinants that predict outcomes for people? There are already so many tools to make a realistic background. We see this in popular games like Grand Theft Auto and Sims. While these games are very realistic, I wanted to take them one step further. Using my theory, I want to focus on creating specifically realistic people. To make it realistic, I want to focus on how life is perceived and how human conscience is formulated into daily decisions which result in life outcomes. This information can be useful for anybody. If people learn the breakdown of variables that go into our decision making consciously, they can use that knowledge to change their life outcome. This information can also be useful for any game developer who is trying to make their AI have realistic intentions and decisions. Using my knowledge of code and researching psychology, I planned to dive deep to

find the answers to my questions. In this essay, I researched different aspects of psychology and different ways to create a simulation. I used this information to make my simulation lifelike.

2 Dependencies

To make a game about life, I must first understand “what is life”. In order to represent life, the game must be able to represent multiple aspects of life. Games like sims represent simple needs of people, however from a players view it seems their decision making is not so complex. Complex decision making would require a few important aspects that life runs, such as motivations, emotions of people, free time of people, intelligences in all categories, and the jobs of people. These are just a few basic categories about what life is; however, these are some of the most important things that impact our daily decisions and therefore impact some of our biggest outcomes in life. I want to make a game that shows these among more life functions and produces realistic output showing what decisions led to various life results.

2.1 Intelligences

The first aspect I have to cover is intelligence. Everyone and every living thing has it. Among people, it is something that makes us unique compared to others. Some of the best human interactions can be formulated based on two people with common intelligences.

When people bring up intelligence quotient (IQ), generally people think it is just a single number that represents intelligence. What most people don't understand is that intelligence is actually made up of several intelligences.

"Gardner (1983) originally proposed that there were 7 intelligences, but upon further studying, he lists 8 different intelligences" (Gardner).

1: "Linguistic intelligence - the ability of using a word in writing or spoken. This also includes the ability to structure a language and using the syntax through its multiple changes" (Gardner).

2: "Logical-mathematical intelligence - the ability to use numbers efficiently. Including skills in detecting logical patterns or relationship." (Gardner).

3: "musical intelligence - the capacity to perceive, manipulate, and perform musical forms" (Gardner).

4: "spatial intelligence - the special perception ability in a visual world. This involves sensitiveness to visual elements like color, shape, form, and their relationships to each other" (Gardner).

5: "bodily-kinesthetic intelligence - the ability to use one's whole body as well as ability to use hands productively and produce things"(Gardner).

6: "naturalistic intelligence - recognizing and classifying numerous species of the persons environment" (Gardner).

7: "interpersonal intelligence - the ability to perceive and detect the moods, intentions, motivations, and feelings of others" (Gardner).

8: “intrapersonal intelligence - self-knowledge and the ability to act based on that. This includes having an accurate picture of oneself, detecting their inner mood, intentions, motivations, and desires” (Gardner).

This just makes sense when discussing intelligence. Growing up, I’ve noticed how intelligence is made up of more than one thing. I have had friends who were good at math, yet have a very hard time reading a page from a book. I have a cousin who is diagnosed with autism, and although he had some problems with math, he could make music out of anything he came in contact with. With this concept being true, it is easy to see how every person can be unique.

2.2 Motivations

Another important factor to creating realistic people is studying motivations. There is a five-factor model of main trait factors of people. The big five are extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience. There are three big things that make people motivated. The big three are achievement, affiliation, and power. There is a hierarchy of motives. At the top are idealized notions of the self. Next is what the individual deems desirable such as values, career goals, and personal strivings. The lowest level is immediate actions such as, “I want this thesis to go well” or “I want to have a good day.” These goals cause people to consciously shape their environment and life situations. Most behavior is motivated by three primary needs: social acceptance, status, and personal meaning. “In pursuit of these three primary needs, people develop consistencies in their behaviors and life choices that are captured in three basic units: what people think of themselves, what others think of them, and

the roles they enact at different stages of the life course" (Roberts). In this study of motivations, they looked at what motivates men versus women and they found the correlation to be .94 (Roberts). What a person chooses as their career choice shows their motivations and can predict their future goals.

2.3 Mood

Mood is a very important aspect of life and how people interact. One of these moods is happiness. Mood is very important to the outcome of peoples positions. "Differential roles of neuroticism, extraversion, and event desirability for mood in daily life: An integrative model of top-down and bottom-up influences" (apa.org). If people are in a good mood, they are more likely to have positive outcomes in their life and the things they do.

Happiness is such an important mood and part of society. Simulating mood and happiness is important to creating a realistic world because mood impacts all of our decisions. In order to simulate happiness, I need to understand exactly what happiness is. I need to know how somebody becomes happy. How is happiness measured? What impacts happiness?

For the past decade, happiness has become a more important policy for life. "Happiness is defined here as a subjective state in which people feel good and function well" (CSR Happiness). Happiness is surely subjective, as two people can have totally different opinions about various things. One person may love basketball and see it as a great opportunity to watch an NBA game live while another person might hate basketball and find it a total waste of time to go to a basketball game.

As well as happiness, the opposite needs to be taken into mind. Being upset is important because we all get upset off and on throughout our lives. When people are upset, they more often tend to make poor decisions that are not related to goals. This is important to simulate to give people the freedom to make their decisions.

2.4 Career success

Career success is the success one may experience while in his/her job field. Knowing what people deem as career success will help me to create a world with realistic people who live out their lives. In my research, I found different people's standards of career. “The career success literature largely presumes that people conceptualize and evaluate their career success only relative to self-referential criteria, such as their career aspirations” (Heslin). People evaluate their success based on their personal career goals.

To implement jobs into the game, I researched the one hundred most common jobs in the United States. Most workers find their job through connections. Because connections are random, I applied this concept by randomly assigning a job to the people at the beginning of the game.

2.5 Free time

Aside from feelings and careers, there are other important things regarding life. Free time amongst peers has to be remembered. It may not be something you originally think of, but if you

look around at people any day, you'll notice how nearly each person spends their free time in diverse ways.

"Nearly 40-50% of time awake is used for leisure" (Stebbins). With this statistic in mind, simulating how people spend their free time is important. Understanding what types of different activities people participate in during their leisure time is important to simulate it.

Leisure activities can be broken into groups. Casual leisure is immediately rewarding however usually not rewarding in the long run. These activities include playing, relaxing, entertainment, sensory stimulation, and social conversating. Depending on a person's life goals and motivation they might find these activities negative. Serious leisure is fulfilling and generally people are rewarded with new special skills. People with big goals and high determination generally make it a career point to do these activities. Project-based leisure is generally occasional. People generally find this to be part of nonwork obligations

Free time activities can be based on life goals, determination, and mood. "Campbell, Converse & Rodgers (1976), the domain most strongly related to the global index of well-being was the domain covering non-working, or spare time activities" (Stebbins). Each activity provides its own benefits. Watching a comedy movie will likely just provide a small immediate increase in happiness whereas playing a language learning game can provide some hedonic happiness as well as eudaimonic happiness.

Happiness is described into two perspectives; Hedonism & Eudaimonism. Hedonism is the happiness that comes from pleasure (ex. dopamine). Eudaimonism is subjective experiences based on human potential and what is worth having (ex. A master student knows he can learn

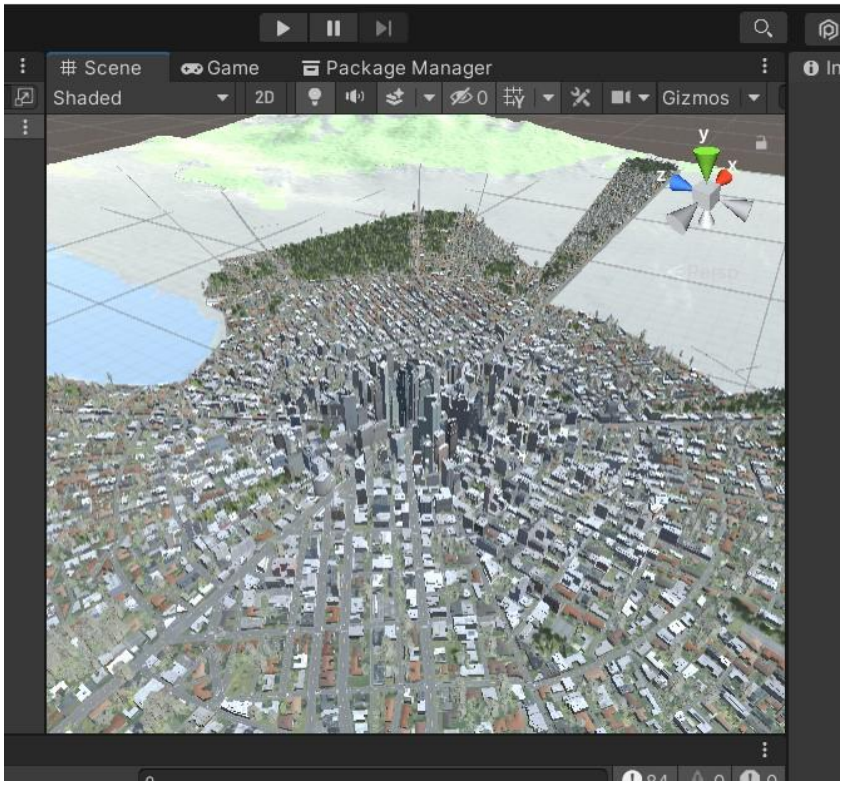
Spanish and realizes the value for himself, he learns Spanish and feels better off). Activities can be categorized based on their potential to produce hedonia, eudaimonia, or a combination of both.

In my simulation, I could implement free time into peoples schedules. This will affect them based on their mood. If a chosen activity satisfies an individual's needs, he or she will continue with that activity trying to do better and better.

3 Method

After all of my extensive research on the aspects of life, I then had to figure out how I wanted to create a virtual world with these realistic people. I developed a method I used to create realistic characters in my game.

When initially researching this idea, many studies said how time-consuming it was because it involves creating a realistic world. Geography Information Systems was my undergraduate degree. While in the program, I had taken a few advanced GIS classes. Before I started my masters in computer science, I had learned a little bit about cityEngine. CityEngine is an application to procedurally construct a city. This is a lot quicker than individually creating buildings. To set up a virtual world for these people, I used arcGIS CityEngine to create a city relatively easily. Afterwards I imported the city to Unity.



In order to keep track of time, I implemented a time function that prints out information after a number of sim days have gone by. Life speed is used to increase the simulation speed.

I use the Math.Floor on timer to convert the time into an integer. Since computers are so fast, sometimes the code would run the loop and come back within a second and therefore running the loop again. With Math.Floor if the repeat time was within a second now the time would match the time the code ran last time causing the loop to end.

```
float timer = Time.time * life_speed;  // speed is used for speedup
```

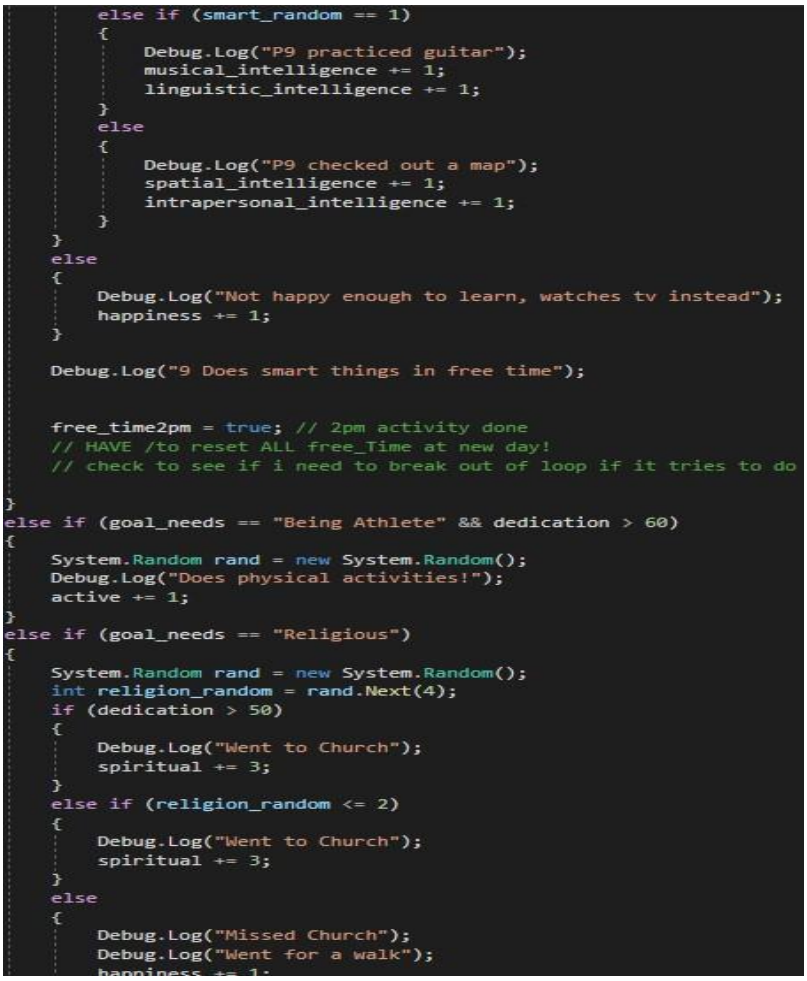
```
my_time = (int)Math.Floor(timer);
if (my_time > 9)
{
    if (my_time % 200 == 0 && my_time > 0 && last_time != my_time)
    {
        Debug.Log("My Name: " + my_name);
```

Next I added the people to the game. I created a life code for each character. This code is responsible for giving the person a random name along with multiple random attributes regarding their lives. The first thing the code does is it generates a random intelligence number for each of the intelligences. Next it randomly selects a motivation for life, as well as how motivated the person is toward their goal. Next each person is given a random job, as people's first job usually is random. If the person's motivations match up with the job, there is a good chance they will stay with the job, otherwise they might look elsewhere for something to match with them.

```
linguistic_intelligence = rand.Next(50) + 30;
logical_intelligence = rand.Next(50) + 30;
musical_intelligence = rand.Next(50) + 30;
spatial_intelligence = rand.Next(50) + 30;
body_kinesthetic_intelligence = rand.Next(50) + 30;
naturalistic_intelligence = rand.Next(50) + 30;
interpersonal_intelligence = rand.Next(50) + 30;
intrapersonal_intelligence = rand.Next(50) + 30;
```

In order to represent a person's mind, there needs to be a wide variety of variables to cover what goes on, even during each decision. To represent each intelligence and the randomness of life, I used the Random class in C#. You can give a range to the Random.next method, so that it returns a random integer between zero and the number given. For each intelligence, I used the random method to return an integer between zero to fifty, and then added a guaranteed thirty to it.

With everything discussed about what life is, I want to create a realistic simulated world. I wanted to give people the power of thinking to make decisions. To give them the power of thinking. In order to do this, I used big if statements to compare some of the many variables that go into even one decision.



```
        else if (smart_random == 1)
        {
            Debug.Log("P9 practiced guitar");
            musical_intelligence += 1;
            linguistic_intelligence += 1;
        }
        else
        {
            Debug.Log("P9 checked out a map");
            spatial_intelligence += 1;
            intrapersonal_intelligence += 1;
        }
    }
    else
    {
        Debug.Log("Not happy enough to learn, watches tv instead");
        happiness += 1;
    }

    Debug.Log("9 Does smart things in free time");


    free_time2pm = true; // 2pm activity done
    // HAVE /to reset ALL free_Time at new day!
    // check to see if i need to break out of loop if it tries to do

}
else if (goal_needs == "Being Athlete" && dedication > 60)
{
    System.Random rand = new System.Random();
    Debug.Log("Does physical activities!");
    active += 1;
}
else if (goal_needs == "Religious")
{
    System.Random rand = new System.Random();
    int religion_random = rand.Next(4);
    if (dedication > 50)
    {
        Debug.Log("Went to Church");
        spiritual += 3;
    }
    else if (religion_random <= 2)
    {
        Debug.Log("Went to Church");
        spiritual += 3;
    }
    else
    {
        Debug.Log("Missed Church");
        Debug.Log("Went for a walk");
        happiness += 1;
```

Next, I used a list of strings to represent common life goals for people. After a goal is randomly selected for each person, the goals needs are determined. For example, someone who has a goal to be smart would have a need to do academic things often. I also used the Random.Next method to generate a random determination integer. If a person had determination greater than or equal to

80, the person would likely be committed to making the decisions that support their goal.

```
string[] college_jobs = { "Registered Nurse", "Programmer", "Accountant", "Teacher", "Lawyer",
string[] jobs = { "Retailer", "Fast Food", "Laborer", "Customer Service", "Janitor", "Secretary
string[] life_goals = { "Being Rich", "Being Smart", "Religious", "Have a Fun Life", "Being Ath
int dedication = rand.Next(100);

if (smarts > 60)
{
    int job_index = rand.Next(6);
    my_job = college_jobs[job_index];
}
else
{
    int job_index = rand.Next(9);
    my_job = jobs[job_index];
}


// int goal_index = rand.Next(4);
// life_goal = life_goals[goal_index];
if (life_goal == "Being Rich") // being rich is subjective, and can be done different ways
{
    int rand_goal = rand.Next(3);
    if (rand_goal > 2) { goal_needs = "Being Athlete"; }
    else if (rand_goal < 2) { goal_needs = "Being Smart"; }
    else { goal_needs = "Making Connections"; }
}
else
{
    goal_needs = life_goal;  // will break down more eventually
}
```

If you look at when life's goal is “Being Rich”, it is a complex goal that might be met in different ways, whereas “Being Religious” is a much more clear goal.

Along with motivations, the five big traits are also randomly generated, as these also correlate to various outcomes. All of these variables affect the decisions made, especially the ones made during free time. Free time decisions generally align with people's goals. However, several other factors come into play.

```
if (my_name == "")
{
    //  first_time = false;
    string[] names = { "Zach", "John", "Bob", "Tim", "Paul", "Tom", "Alina", "Cam",
    string[] last_initial = { " A", " B", " C", " D", " E", " F", " G", " H", " I",

    int index = rand.Next(18);
    int last_index = rand.Next(26);
    my_name = names[index] + last_initial[last_index];

    extraversion = rand.Next(100);
    agreeableness = rand.Next(100);
    conscientiousness = rand.Next(100);
    neuroticism = rand.Next(100);
    open_to_experience = rand.Next(100);
```

After generating traits for each person, a function is used to determine which trait is highest for the person. Because different traits correlate to different goals, I used functions to add randomness to correlate to these traits

```
if (my_best_trait == extraversion)
{
    int extraversion_random = rand.Next(10);
    if (extraversion_random > 7)
    {
        life_goal = "Being Rich";
    }
    else if (extraversion_random <= 2)
    {
        life_goal = "Making Connections";
    }
    else if (extraversion_random <= 7 && extraversion_random > 5)
    {
        life_goal = "Making Connections";
    }
    else
    {
        life_goal = "Have a Fun Life";
    }
    //
}
else if (my_best_trait == agreeableness)
{
    int agreeableness_random = rand.Next(10);
    if (agreeableness_random > 7)
    {
        life_goal = "Help Others";
    }
    else if (agreeableness_random <= 2)
    {
        life_goal = "A Good Job";
    }
    else if (agreeableness_random <= 7 && agreeableness_random > 6)
    {
        life_goal = "Making Connections";
    }
    else
    {
        life_goal = "Religious";
    }
}
else if (my best trait == conscientiousness)
```

To interpret the results, I set my code to print out each player's attributes after various amounts of days.

```
Debug.Log("My Name: " + my_name);
Debug.Log("Smarts: " + smarts);
Debug.Log("Happiness: " + happiness);
Debug.Log("my Day: " + my_day);
// Debug.Log("Index: " + indexx);
Debug.Log("Job: " + my_job);
Debug.Log("Goal: " + life_goal);
Debug.Log("goal Needs: " + goal_needs);
Debug.Log("Satisfied: " + satisfaction);


if (goal_needs == "Being Rich")
{
    satisfaction = money;
}
else if (goal_needs == "Being Smart")
{
    satisfaction = smarts;
}
else if (goal_needs == "Being Athlete")
{
    satisfaction = active;
}
else if (goal_needs == "Religious")
{
    satisfaction = spiritual;
}
else if (goal_needs == "Have a Fun Life")
{
    satisfaction = happiness;
}
```

4 Results

This showed that the most important determinants for decision making were life goals and mood. As stated in many papers and quoted several times, mood plays a big part of our daily decisions. When a person is happy they are more likely to do a free time activity that is geared towards their goal.

Out of tests on the lives of fifty sims, eighteen of them were initially happy. Since they were happy, between 75-80% of the time they would commit their free time to the serious leisure that matched their goal, except those who had goals to “Have a Fun Life” in which their “Serious Leisure” was casual leisure. Although casual leisure doesn’t reward much of anything to people with high goals, it does provide the hedonic happiness that those fun life lovers desire.

Aside from just those who are happy, People with high dedication towards their life goals very often choose the decision that corresponds most with their goals. When people are motivated, they put aside some feelings and do the best thing for their goal. As one might predict, those with a goal to “Have a Fun Life” had an easy time making decisions to meet their goals. In my game these people would often choose hedonic activities all day long. Whereas people who had a goal to “Be Smart” had much more fluctuation with their decisions. Those who had high dedication, generally stuck with their decisions towards their goal, with occasional “breaks” or casual leisure activities. One sim with 89 dedication to “Be Active”, had committed free time towards physical activity 18 of 20 decisions.

5 Conclusion

Although people’s lives are unique, random, and made up of many layers, it is possible to make a game that can represent realistic people and their decisions. There is an extensive amount of psychological data to describe human behavior and decisions. To make a game parallel to life may be impossible, as life is made up of possibly unlimited studies. However, with enough research and time to develop, a game could be a very good way to represent people’s lives and decisions.

The game showed that the main determinants to decide what free time activity is committed are happiness/mood and life goals/dedication.

Those who were happy committed activities to meet their goals more often. Along with matching the research, it also makes sense. On days people are happy they want to “stay happy” or try to prepare for the future in which they will be happy. In order to prepare for the future, people commit activities to try to reach their goals and therefore become happier.

While the mood effectiveness may be a little biased, as the developer I can decide how much it affects the outcomes. The fact is that mood truly does play an important part in daily decisions. People who are happy generally make “good” decisions or decisions that correlate with their goals. When people do this they become more happy, creating a cycle of happiness. This correlates with several of the studies supporting well being with happiness.

Dedication and life goals played a huge part in the people's lives. This makes sense as life goals shape the decisions and actions of each person's life, and dedication determines the frequency of these actions. Even when people are unhappy, if they have high determination they can tolerate more and aim for their goals. In my game those with high determination would commit serious leisure until they reach their happiness threshold in which they commit time to casual free time to increase their immediate happiness. Sometimes I study with a similar philosophy; serious work for numerous hours followed by a 15-30 minute break.

This game also shows what things are less important when making decisions. Pop Intelligence doesn’t explain what a person is like more than it describes who someone is.

Someone who is gifted at a high level for multiple intelligences may have a life goal to be happy and therefore the person spends a lot of their free time doing casual leisure activities. Whereas another person may not have a high intelligence in any category, however they have a life goal to be smart. That person would spend a lot of their free time doing serious leisure or activities that are rewarded with new skills.

6 Discussion

I am happy with my results, but my conclusion is correct in that there are so many other resources that can be taken into mind to make this game even more realistic.To make this game more realistic, happiness can be broken down into further categories.

In my game I used satisfaction to represent Eudaimonic happiness, although eudaimonism can be broken into “purpose of life”, “Environmental mastery”, “Autonomy”, “Self acceptance”, and “Personal Growth.”

Subjective happiness is composed of many elements and itself can be enough to determine outcomes for people. However, objective happiness could also be implemented to make the game much more realistic. Some objective indicators for happiness are housing, income, employment, education, environment, and civil rights.

When people are happy there are further ways to break down the positive effect that may occur. Positive effects can be confidence, optimism, likeability, sociability, energy, and physical well being.

A Person's life goal is a major way to shape his/her life. However research shows there is a hierarchy to goals. Life goals being major life goals over a long period, intermediate life goals like learning a new language, and small life goals such as having a good day today. It would be cool to implement layers of goals. The result would be people having inner thought battles to determine which goal to meet now.

There is already so much involved with one human and his/her decisions, however creating relationships and friendships would be a big addition to the game. Research would be needed to determine what people look for in friends and partners, but the game would be amazing if like minded people created friendships as many actions can then stem from there.

My game is essentially a backbone for a bigger game, if these philosophies were taken and implemented into a game like sims the game would become more lifelike.

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