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Flappybirds Clone: A GUI Implementation of C++ Using Machine Learning and STL

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ABSTRACT

Flappy Bird is a side scrolling game that involves tapping the screen or clicking a single button to navigate a bird through a gap between pairs of vertical pipes. When the bird passes through the gap, the score increments by one and the game comes to an end when the bird hits the floor or a pipe. Flappy Bird is a very difficult game and scores in single digits are quite common even after days of practice. The overall project allows us to replicate this famous mobile game to our computer devices through visual studio by the use of C++ and also explain its working through machine learning. Pipe size depends on your pipe objects, the basic idea is to generate a random value(between 1-10) to locate the top pipe at a position between the top of the screen and the bottom – the space between pipes. Then locate the bottom pipe at the position of the top pipe + space between pipes + random offset value. Decoy pipes check that you're creating the pipes in the right layer, that you're not spawning pipes over the player and your collision checking events.

KEYWORDS-STL,SDL 2.0,Q-Learning.

1. INTRODUCTION

The game is a side-scrolling endless game where the player controls a bird, attempting to fly between from between the random gaps of green pipes without hitting them. The game was initially released in May 2013 but received a sudden rise in popularity in early 2014 and became a hit. The game was criticized by some people, who criticized its high difficulty level and alleged similarity in graphics and game mechanics, while on the other hand some reviewers found it addictive. At the fall of January 2014, it was the most downloaded free game in the App Store for IOS as well as the play store. During this period, the gross income of the game was around 50,000$ per day from in-app advertisements as well as sales. Flappy Bird was taken down from both the App Store As well as the Google Play store by its developers in the mid 2014. He claimed that he felt guilt over what he considered to the game being addictive in nature and players playing it for hours in order to reach a certain end point. C++ is a class oriented programming language designed with an orientation toward systems programming and embedded,

Contribution-Flappy Bird is quite similar to a game resource constrained software and large systems, with performance, efficiency, and flexibility of use as its design highlights. STL stands for Standard Template Library. The standard library is comprised of a set of algorithms and data structures that were originally part of the C++ Standard template library. If you are dealing with many elements, then you need to use some sort of

container in order to store the data items. The container can be described as objects that could be used to store the collection of data items. Iterators are used to access data in the containers, and it helps in traversing through the elements of the containers using its functions. They can be increased and decreased as per choice and help in the manipulation of data in the container. In STL, different types of algorithms can be implemented with the help of iterators and data structures. Algorithms can be defined as a set of instructions applied to the containers and which provide operation for the content of the container.

2. LITERATURE REVIEW

Author-KEK
Year-2011
graphics, audio and network. With SFML, the application can execute and can run easily on the most commonly available operating systems like Windows, Linux, mac OS and Android. SFML has official bindings for the C, C++ and .Net languages.

SDL Framework
released in 2011 (two years before Flappy Bird) called PiouPiou vs. Cactus, from the
gameplayto the main object design and the obstacles.

Author-DONG NGUYEN
Year-2013
Contribution-Flappy Bird is a game developed by Vietnamese video game artist and programmer Dong Nguyen, under his game development company named Gears.

Author-NOLAN BUSHNELL
Year-2014
Contribution-Nolan Bushnell, the developer of the video
game Pong, compared Flappy Bird to his own game and stated that the "simple games are more satisfying"

Author-JOHN ROMERO
Year-2014
Contribution-John Romero, one of the creators of the classic first-person shooter Doom, commented that Flappy Bird is "a reaction against prevailing design the way grunge was a reaction to metal."

Author-KEVIN CHEN
Year-2015
Contribution-Deep reinforcement learning(or Q-Learning) is quite effective at learning how to play the game flappy bird
Despite of the high sensory input.

3. METHODOLOGY

We have proposed a C++ based gaming application which uses the basis of STLs present in C++.The game could also be developed using the machine learning frameworks that are reinforcement learning and deep Q-learning to train the model to generate random gaps. The game implements the usage of GUI based C++ for graphic rendering and also for the game physics like the velocity of the bird, parabola trajectory of the bird, speed of generation of pipes, distance between the pipes etc. The game provides a never ending gameplay and the code could be used as base to develop the game on different gaming platforms like android, IOS etc.

SFML Framework
SFML is a simple add on STL in C++ that provides a simple interface to the various components of your PC, to ease the development of games and multimedia applications. It is basically comprised of five modules that are system, window, an off-policy model. Model-free meansthat the agent uses Simple DirectMedia Layer is a cross-platform development library based on C and designed to provide entry level access to audio, keyboard, mouse, joystick, and graphics hardware via OpenGL and Direct3D. It is used by video playback software engineers, emulator experts, and popular game developers.

SDL supports various operating systems like Windows, Mac OS, Linux, IOS, and Android. SDL can support various other platforms depending upon its source code. SDL is based on C, works efficiently with C++, and there are alternatives available for several other languages which includes C# and Python.

Reinforcement Learning
Reinforcement learning is a machine learning algorithm to make a sequence of decisions. The agent learns to achieve a goal in an unknown and highly complex environment. In reinforcement learning, an artificial intelligence model faces a game-like situation. The

computer employs trial and error method to designate a solution to the problem. To get the machine to do what the programmer wants, the artificial intelligence model either is correlated to its vertical velocity. Animation (flapping and fainting) only occurs when moving upwards or when the bird encounters an end game condition. Our primary focus will be to get these things implemented as closely as possible, as the feel of the gameplay depends primarily on the physics implemented in the game.

Q-Learning

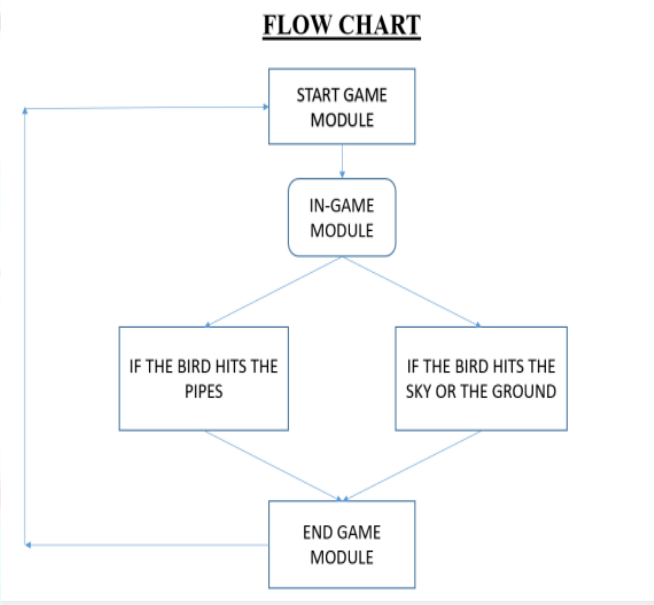
Q-Learning is a Reinforcement learning policy that provides the best possible outcome according to the current state. It chooses the action randomly and aims to maximize the reward. Q-learning is a model-free, off-policy reinforcement learning algorithm that aims at finding the best course of action, according to the present state of the agent. Depending on the position of the agent in the environment, it will decide the next move to be executed. The main aim of the model is to find the best course of action according to its current state. To do this, it may come up with its own set of rules or instructions or it may operate outside the policy given to it to follow. This means that there is no necessity for a policy, hence we call it is a limit to it. We cannot go faster than this velocity cap. No matter the current velocity, the bird will gain the same amount of height when the screen is tapped or the button is clicked.

The Pipes

The Pipes may be the most delicate part of the game to get perfectly right, but it's essential that we do so. A large part of the success of this game is its difficulty and never ending behaviour. Ifthe difficulty ever changes, by our miscalculation of thespeed or generation of the pipes inconsistently, the game willbehave abruptly. It'll not have that frustration-prize dependence system. You no way see further than 6 pipes at formerly, so we will producepipes. The pipes feel to appear at the same time intervalevery time, so the distance between each set of pipes willbe equal. As soon as one set of pipes moves beyond the left edge of the screen, we will re-determine the height (more on that below) and move theset to appropriate position beyond the right edge of thescreen.

predictive methods of the environment's expected response toa certain move. It does not use the reward system to learn about the environment but rather a basic trial and error method.

4. EXPERIMENTAL RESULTS



Collision Detection System

When should the game end? Although the developer sets the price policy – that is, the rules of the game – he gives the model no hints or suggestions for how to crack the game. It's up to the model to figure out how to perform the task to maximize the price, starting from completely arbitrary trials and finishing with sophisticated tactics and phenomenal expertise. By using the power of search and numerous trials, reinforcement learning is presently the most effective way to hint machine's creativity. In distinction to human beings, artificial intelligence can gather experience from thousands of resembling gameplays if a reinforcement learning algorithm is run on a sufficiently important computer structure.

We're going to create a hit box for our bird, which will be used to check for collisions with the pipes. We do not want a small hit box, as that would make the game too easy. We do not want to make a large hit box, because people will get angry if they die without hitting anything. For this we need to produce a single hitbox with a rectangular object.

Bird Physics

It's delicate to experiment with physics in this game without dying, but I've discovered the following:

The bird follows an acceleration due to gravity i.e. perpendicular velocityis always adding downwards. But there

The altitude of the opening may be different, but the size of theopening does not change. The easiest way to apply this would be to simply move the column vertically to a Arbitrary Y position when we reset its position (within parameters). When we apply the pipes, we willexamine the pattern in farther detail to determine whetherthey truly follow a arbitrary pattern and how important they areSuitable to shift up and down.

5. CONCLUSION AND FUTURE WORK

The Flappy Bird clone game developed by us will be suitable to give the same user experience as the original game. The users will be suitable to fluently run the game, with all its dynamics it'll be suitable to give an utter amount of Pleasurable experience. The game will be suitable to induce a arbitrary gap sequence for and endless quantum of time. One difficulty for druggies is that the vertical shifting speed will adding as time goes on. We also Enforced a hidden trick in the single player mode. When stoner achieves 10 scores, the flappy raspberry will evolve into flappy Joe. Using C++, we learned a lot about Object acquainted approach, configuration with other platforms and above all the conception of Graphics as used in Computers. Our course class helped us explore further about the design that we were dwelling into and hence give us a wider perspective of how plates and simple rendering gives us a stoner experience so soothing and commodity to cherish over and over.There are multitudinous possibilities to

14) "Flappy Bird Tips: How To Get A High Score Without Cheats". Huffington Post. Archived from the original on February 5, 2014. Retrieved January 31, 2014.

15) SDL_Init -- Initializes SDL

16) SDL_WasInit -- Check which subsystems are Initialized

17) STL Programming from the Ground Up a book by Herbert Schildt

18) Using the STL: The C++ Standard Template Library a book by Robert Robson the future of thegame. The game could be rendered in 3D graphicterrain with 3- dimensional drugs inferred. Instagram created an AR interpretation of the game in which we used our nose to control the stir of the raspberry while watching the screen of the phone using its frontal camera. Longer training times, the stylish performing agent was trained for a aggregate of 15 hours and only reached,674 occurrences. apply prioritized experience renewal. Train an agent which never dies in the Flappy Bird terrain

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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