PLATFORMER AI: TURING TEST

ASSIGNMENT 2 ~ CS 4150/5150 ~ FALL 2013[1]

For graduate students, this is an individual assignment. Undergraduate students may work in pairs. You may use late days on this assignment if you wish.

Deadline: **October 18, 11:59pm**

DESCRIPTION

For this assignment, you will be creating an AI controller for Mario, such that Mario will be able to traverse arbitrary levels. The focus of the assignment is on decision-making and movement within a continuous 2D environment. The Mario AI Competition has been held at the IEEE Computational Intelligence in Games conference each year for the last four years; you will be using the framework from the 2009 version of this competition.

You will be turning in:

1. Full source code.
2. An assignment writeup, in PDF format.
3. A short video of your Turing Test controller, posted on YouTube or Vimeo.
4. A readme text file containing: your name(s), the names of any people who helped you with the assignment, references to any external sources you used, a list of all the files you created for this assignment and their location, complete instructions necessary for getting your code to work, and how many late days (if any) you wish to apply to the assignment. **And don't forget to include the link to your video!**

For undergraduates: only one person is required to submit the assignment.

PASSING THE TURING TEST?

Your goal with this assignment is to create an agent that could pass a Turing Test when compared with non-expert (but still relatively competent) human players.

You are being provided with an existing A* agent, created by Robin Baumgarten. This agent won the gameplay competition in 2009. The existing agent has a goal to reach the end of the level. You may use this code as part of your agent if you wish, though the majority of what you turn in should be yours (it is acceptable to modify the A* agent to use some different goal and/or heuristic as part of your assignment).

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[1] This assignment description is borrowed and modified, with permission, from Prof. Mark Riedl at Georgia Tech: https://research.cc.gatech.edu/inc/sites/edu.inc/files/cs4731/project2.html

Make sure to clearly note where you are re-using someone else's code. You will also see a simple "jumping" agent, for your reference.

You must implement any of the decision-making techniques we've discussed in class (e.g. decision trees, behavior trees, finite state machines, a planner), or you may choose to use some other AI technique that you have learned about elsewhere.

These are some things you might want to consider when creating an agent that acts like a human:

- Humans typically make mistakes.
- Human players have different preferences and play styles. Some like to try to collect everything, some like to kill all the enemies, some like to run. But very rarely does a human player act as a complete caricature of these styles; most will balance several goals simultaneously.
- Humans exhibit emotions. These can be pretty hard to identify in a platformer player, but consider elements such as surprise at enemies appearing or freezing if overwhelmed by several challenges at once.
- You may want to ask friends to play Mario while you watch and take note of any behavior they exhibit (remember our ethnography exercise).
- Your agent needs to be able to perform on a variety of different levels; be careful not to overfit your agent to a single example level.

There is no single correct answer to this assignment. Be creative, but be careful to take small steps towards your goal. If you are too ambitious at first you can easily get lost. **You are encouraged to share your high level strategies with the rest of the class, but do not share code.**

Please do not modify the framework itself. Your agent code should be placed in its own directory and given its own name, following the structure of the two provided agents. Your agent should be written in Java.

ASSIGNMENT WRITEUP

Your writeup does not need to be very long –a page or two is sufficient. Argue for what your goal was with the agent, why your goal is reasonable, and how well you feel you achieved it. State which technique(s) you used and why, and what the pros and cons were of your chosen technique. Describe the strengths and weaknesses of your agent. This writeup should also document any steps in your process that you wish to highlight.

SUGGESTED TIMELINE

You have almost three weeks to complete this assignment. During one of these weeks, there is no class and no reading, use the extra time to work on this assignment in parallel with your midterm paper. Please start working on this early! If you wait until the night, or even the week, before it's due, you will be very sad. This research framework is, tragically, not very well documented. Part of this assignment involves familiarizing yourself with it. Cooperate with your classmates and feel free to share your discoveries with the class via Piazza.

Week 1: Familiarize yourself with the framework. Play with and/or modify the A* agent. Consider modifying it to achieve a different goal (e.g. having it collect all the coins) as part of your experimentation.

Week 2: Begin work on the Turing Test controller.

Week 3: Finish your controller. Make your video and upload it. Complete your writeup.

EVALUATION

This assignment will be graded according to the following rubric. **In order to earn partial credit, your code must compile. Code that does not compile will earn a failing grade on this assignment.**

Any evidence of copying or cheating on this assignment will result in a grade of zero and a report being filed with OSCCR.

	Excellent (9-10)	Good (6-8)	Not Good (3-5)	Poor (0-2)
Mario Controller – Technical Correctness and AI Design (65%)	A well-crafted controller that correctly implements a decision-making technique; clearly an effort to make the agent act human.	A controller that implements a decision-making technique; may have some minor bugs. Makes some effort to act human, though perhaps not as sophisticated or well-thought-out as an "excellent" controller.	Many problems with AI implementation, though it's clear an attempt was made to do something interesting.	Little to no evidence of effort in designing a new AI system.
Code Style (10%)	Code is well-commented; code is formatted clearly and is legible (e.g. appropriate variable names); good code re-use (if appropriate).	Some deficiencies in style, but overall code is still legible (i.e. does not meet all of the requirements for "excellent" but does meet many of them).	Very few comments; poorly chosen variable names, lack of code re-use.	Completely illegible code; lack of comments; very poor coding style.
Writeup (10%)	Well-written, justifies the techniques used and the goals. Shows strong evidence of reflection upon the AI implementation.	Minor flaws in writing (e.g. spelling and grammatical errors), but still effectively argues for and justifies the techniques used. Shows evidence of reflection upon the AI implementation.	Flawed argument that does not clearly or correctly state why a decision-making technique was chosen, but does still meet the requirements of the writeup (i.e. describing the technique, describing strengths and weaknesses to approach).	No writeup, or so poorly written as to be unintelligible.
Human Believability (15%) – based on class and instructor votes	Voted among the top 20% of AIs in the class in terms of human believability.	Voted among the top 50% of AIs in the class in terms of human believability.	Voted in the bottom 50% of AIs in the class in terms of human believability.	Voted in the bottom 20% of AIs in the class in terms of human believability. --or-- Did not include a video.

RESOURCES

1. A copy of the Mario AI framework, including Robin Baumgarten's A* framework and Sergey Karakovskiy's Jumping Agent is here: http://www.ccs.neu.edu/course/cs5150f13/marioai_with_astaragent.zip
2. Robin Baumgarten did an interview with AI Game Dev that you may find helpful in understanding his design decisions: http://aigamedev.com/open/interviews/mario-ai/
3. This paper describes the Mario AI benchmark: http://julian.togelius.com/Togelius2009Super.pdf
4. The Mario AI competition has resulted in several academic papers. Here is a link that points to several of them; however, there are more out there if you are interested in finding them. Most have been published at IEEE CIG in the last three years: http://www.marioai.org/RelatedPapers
5. There is a Google Group for the Mario AI competition here: https://groups.google.com/forum/#!forum/mariocompetition. However, bear in mind that you are using an older version of the framework (due to the availability of sample agent code), so some of the details in this group may no longer be valid.

SUBMISSION INSTRUCTIONS

Turn in a .zip file on Blackboard containing:

- All of your source code, including the original framework code.
- Your readme file, including a link to your video.
- Your project writeup.

Assignments must be turned in via Blackboard. **Emailed assignments will not be accepted.**