Connect 4 Term Project Final Report

Project Team 45

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Summary:

Project Team 45 collaborated on a C++ Connect Four program. The program consists of an AI (artificial intelligence) that plays against the user always deciding a good move to make in response to the user's moves. The system is not a perfect AI so it is possible for a human to beat it. In other words, it does not always make the best move in response to the user. The project utilizes computer vision via USB webcam to read a real life connect 4 board and be able to establish different colors representing different users and then make moves in response to the user's moves. The real life board would be placed directly in front of the camera (with a black backdrop to optimize visibility) and the game would be played by the user playing with physical pieces. The AI is composed of two algorithms: one handles basic gameplay which is random in nature and another handles so-called "dangerous spots" where the AI notices if the user has 3 in a row and then tries its best to block the user from having 4 in a row. The AI always makes the first move, and once the user makes a move, the program would output the position of the AI's next move using text to speech and a command line interface. The game continues until the user or AI gets 4 in a row or the board fills up with no remaining slots left.

Lessons Learned:

During the coding of this project we ran into our fair share of bugs and seemingly insurmountable logic errors. We had to make various changes to our original vision for the program as it progressively increased in difficulty. For example, we initially intended to have to program consist of different functioning AI's (play modes) that increased in difficulty and ultimate have a mode that would always make the best possible move at every turn (a perfect AI). As we coded it, however, we realized the complexity of such an algorithm and decided to focusing on perfecting other simpler aspects of the program such as the computer vision and the text to speech. Overall, we learned to pace ourselves with respect to the demanding features we were trying to implement.

Future Work:

Other applications of the design implementation used in this project could be seen in other consumer board games such as checkers and chinese checkers. Future improvements include optimizing the AI to behave in different modes of difficulty including a perfect AI that chooses the most competitive move at every turn. In addition, added functionality could be implemented into the text-to-speech function which could include a wider array of voices as well as wittier and more competitive phrases. Also, the understanding we gained in making a simple AI is indispensable in potential ventures with more complex AI.