

FINAL PROPOSAL for PROJECT

Aim: We want to analyse that how game of chess can help us to realise solution to some real life problems like designing an algorithm for automatic cars or to help in coming up with good military strategies , etc.

Problem:-

We were successful in making computer chess game which is unbeatable to any opponent in past. So what our algorithm (local min-max search over gamespace) exactly does is that after each move it will analyse all the possibilities and will come up with best possible move. Humans don't have this capability and it is said that on an average a human can think about only 50 possibilities while deciding a move. So we can safely say that a human cannot beat computer in chess. So we usually believe that we have made an AI system which has superhuman capabilities and surpass humans in chess.

Now let's modify our chess board a bit. What if our chess board have infinite squares and may be infinite pieces too. Will our superhuman algorithm which earlier was unbeatable , works in this case too?

Well! if you think it will , then try to answer two questions , first- do you have enough memory to compute on infinite data? , second-how much time will system take to decide a move? .

Our real life problems are more like the last case of chessboard that we discussed above. Imagine that we want to develop an automatic car. Let us assume that to gather data from surroundings we are using best available sensors and technology , minimizing the time latency. Now the motive of our algorithm is to analyse the gathered data and decide the next operation within a fixed time limit .(as you don't want to take a right turn after coming 100 miles ahead of that turn.). Now the first question , can we make a superhuman AI system which cannot make a bad decision at all for this task too. We could have achieved this if we had a suitable operator whose eigen functions corresponds to state functions of possible action of external factors like nearby moving vehicles , any path blockage , traffic signals , etc. But we

can't actually make such an operator because the situation is too complex with very large uncertainty (also this operator itself might be of infinite dimensions). So we can conclude that unlike 8*8 chess game we cannot analyse all the possibilities here. So how do we actually solve this task?

Possible solution:-

We can make an algorithm which works in a very similar way to how a human decides to make a move in chess game. So imagine that, a black's pawn is blocked by 2 or 3 white pieces but the black queen has a clear way of moving further on board. Now the player who is playing white pieces will ignore black's pawn and only try to analyse the possible threats posed by black's queen in future moves. If somehow our algorithm simulates this human's way of thinking then our problem will be solved. So for us, the notion of AI is not something which surpasses human but it actually is a system which can develop a working mechanism similar to that of humans to a maximum extent.

Our project:-

- We will develop a chess game where a person plays against computer. The game will have two modes i.e. superhuman mode and human mode. Superhuman mode will use the basic local min-max search over gamespace to decide a move. For human mode we will try to design an algorithm on our own to simulate human's way of thinking to a maximum extent.
- As we mentioned above, in 8*8 chess computers are unbeatable, so to place the computer and human on equal footing we will implement quantum chess where each piece is a superposition of multiple pieces and we can be assured about the state of a piece only if we select it for the next move.
- As we mentioned earlier, that the real world can be represented as a multidimensional chess board, we will try to come up with some algorithm for 2-d dimensional chess board or may be 3-dimensional also. Based on our study and results of the same topic, we will give our views about

how can we implement a N-dimensional chessboard (though it sounds like an impossible task , but we'll try to put forward some ideas about this).

- Just to make game interesting for user , we'll add some extra features to our app. Firstly our app will have some cool categories of chess game like dice chess , card chess ,etc . Secondly , our app will have a feature which allows the user to define a short board game puzzle (from pieces to their initial position) which will be solved by computer ,following all the constraints set by the user. App will check if it is possible or not to win in the given situation. In case if it is possible then app will just show the complete solution to the user as some appropriate sequence of moves.
- We will write a documentation about real-life problems where chess game may help us to develop an algorithm for AI system to solve that problem.

Tentative timeline:-

Writing algos for different chess types

As we are 6 members we will form 3 teams of two and will write one algo per team such that each member can have hold over the basic mini max algorithm

~8 days (can be +-2)

designing a user interface for the application

We will form teams here also but as we yet dont know how are we going to write and design it so we cant really predict it how are we going to form teams for this but definitely we will

~15 days(can be +5)

Our buzz word quantum chess

This phase will involve reading text and discussing wht all shud be done in this phase and finally implementing this

~10 days

N-dimemsional chess

~6 days

Documention of real life chess related problems

~3 days

Deploying the application on play store (if possible)

~3 days

GROUP MEMBERS:-

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