Interim reports are due in December 2016. They should be more than 250 words. It should reference 5 sources and contain citations as well as answer the following questions:

- What is the project about? (the definition of the problem)
- How are you/do you plan to solve this problem computationally?
- What progress have you made up to this point? (research, code, etc.)
- What results are you expecting?

Interim Report

Team Number: Pinon-1
School Name: Pinon Elementary School
Area of Science: Computer Science
Project Title: Checkmate with King and Queen
Team Members

- Shaun Kilde
- Daniel Kim

Problem Definition

Computerized chess, although originally known for human vs. their own computer or phone on an app, there are many different supercomputers used to play the world's best chess players (Grand Masters). These supercomputers, such as Deep Blue[1] are used to discover new medical drugs, to do extensive financial remodeling to analyze trends, handle broad database searches, and perform immense calculations needed in many fields of science. Modern supercomputers such as the current most powerful supercomputer Tianhe-2 , has the performance of 33,860 trillion calculations per second. In attempting this project, our group is undertaking the research and simulation of using algorithms on a chessboard and making a checkmate. Our target is to program the computer using the algorithms and creating a checkmate going against itself, with a White King and a White Queen, vs a Black King. We hope that the computer simulation will learn from the past game experiences and get better and better at creating an endgame. The computer will push the King into both and edge or a corner and checkmate using the checkmate combinations. The checkmate combinations are where the Black King is, and where the White King and White Queen are when there is a checkmate. For example, if the Black King is at h5 on the chessboard, the White King can be at f4, f5, or f6, and the White Queen can only be at g5 on the chessboard. This will allow the computer to make a checkmate and win the game.

[1] http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/deepblue/

Problem Solution

In this simulation, the computer will randomize the pieces and move black in a safe spot. Not in check or in checkmate. The Black King will go first and move away from a check, and away from a checkmate. The computer will make sure that the Black King doesn't make an illegal move. The White Queen will keep on moving the Black King into an edge or corner by keeping a knight's move away from the Black King till the Black King reaches a corner or edge. When the Black King gets to an edge, the White Queen will give the Black King some moving place so the result isn't a stalemate. Then, the White King will move up and create a checkmate using the checkmate combinations.

Progress to Date

Presently, we have made the checkmate combinations for White King, White Queen, and the Black King. We have also researched on the history of computerized chess. Also, our group has been working on learning Python by taking a course on udemy and read a book called "Teach Your Kids How to Code" the book teaches us the basics of Python and making graphics with "turtles". We have also made the coding plan (who's going to code what) for the two king's movement, the queen's movement, the file operations, machine learning, and setup operation. We have made a website to help us keep up to date on what we have to do. Eventually, we will start the coding on the things we were assigned on the coding plan.

Expected Results

The results we are expecting is for the checkmate to happen with the two kings and the queen, and the machine to learn so the computer can make a checkmate faster and more efficiently. We hope that the project we do will help us make new programs such as King and Rook vs King, King and two Knights, King and two Bishops, etc. The solutions are known (given in the table below) so that we can validate the runs and determine solution convergence.

Checkmate Combinations

Black King	White King	White Queen
a1	a3, b3, c1, c2, or c3	a2, b1, or b2
a2	c1, c2, or c3	b2
a3	c2, c3, or c4	b3

a4	c3, c4, or c5	b4
a5	c4, c5, or c6	b5
a6	c5, c6, or c7	b6
a7	c6, c7, or c8	b7
a8	a6, b6, c6, c7, or c8	a7, b7, or b8
h1	f1, f2, f3, g3, or h3	g1, g2, or h2
h2	f1, f2, or f3	g2
h3	f2, f3, or f4	g3
h4	f3, f4, or f5	g4
h5	f4, f5, or f6	g5
h6	f5, f6, or f7	g6
h7	f6, f7, or f8	g7
h8	f6, f7, f8 g6, or h6	g7, g8, h7
b1	a3, b3, or c3	b2
c1	b3, c3, or d3	c2
d1	c3, d3, or e3	d2
e1	d3, e3, or f3	e2
f1	e3, f3, or g3	f2
g1	f3, g3, or h3	g2

Research (Daniel)

[2]On May 11, 1997, a IBM manufactured supercomputer Deep Blue won a world chess champion game after a six game match: Deep Blue won three times, one for the champion, and three draws. This match lasted for a few days, and had massive interest from media coverage from around the globe. Deep Blue was such an advanced computer, it was able to analyze 50 billion moves in three minutes. Behind the match was very crucial computer science that pushed forward the capability of computers able to handle the complex computations needed to help and discover new medical drugs, to do the extensive financial modeling to analyze trends, handle broad database searches, and perform immense calculations needed in many fields of science.

[3]During 1985, in Hamburg Germany, Garry Kasparov, known as one of the greatest chess players of all time, Kasparov played against 32 different chess computers at the same time in what is acknowledged as a simultaneous exhibition. He walked one machine to the next, making moves for the period of more than five hours. The four leading chess supercomputing manufacturers had sent their top models, along with eight computers named after Kasparov from the electronics firm Saitek. The state of computer chess was not that hard for Garry when he received a perfect score of 32-0. Although he had a distressing moment while he was playing one of the “Kasparov” brand models. However, Garry found out a way to trick this machine, he made the machine make a sacrifice, that the machine did not need to do. 11 years later, during 1997, Garry Kasparov barely defeated the IBM produced Deep Blue. Then IBM doubled its efforts and increased the computer’s processing power, and Kasparov lost the rematch against Deep Blue which made headlines around the world.

Research (Shaun)

In 1770 Wolfgang von Kempelen built the first chess playing machine, also known as the Mechanical Turk[4], as a joke, or an amusement for royalty. Kempelen showcased his Turk to the

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[2] http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/deepblue/
[3] http://www.nybooks.com/articles/2010/02/11/the-chess-master-and-the-computer/
[4] The Mechanical Turk

Empress Maria Theresa of Austria-Hungary. The seemingly intelligent play of the mechanical Turk brought questions of whether it was truly “thinking”. It quickly became a sensation in Europe.

Einstein’s theories of relativity, and his explanation of the quanta in the early 20th century changed the scientific world again. In this century, the first true chess playing computers were built. The electronic computer became known as a brain (not a clock). And it was in this context that computer pioneers like Alan Turing, John Von Neumann, Claude Shannon and others finally succeeded in building a real mechanical “Turk.”

Alan Turing wrote the first computer chess program[5]. In 1950 Shannon wrote a chess playing program that appeared in "Programming a computer for playing chess". In 1952 Alick Glennie defeated Alan Turing's chess program, TurboChamp[6]. He was the first person to beat a computer program at chess.

Year	Computer Chess Rating (best fit)	Human Percentile
1950		0%
1955		0%
1960	1201	49%
1965	1400	61%
1970	1599	74%
1975	1797	87%
1980	1996	95%
1985	2194	98%
1990	2393	100%
1995	2592	100%
2000	2790	100%
2005	2988	100%
2010	3187	100%

[5] Turing and Shannon
[6] A Short History of Computer Chess