State space in my program is start from the cat position and to the position that cat catch the mouse (if it exists). The state space includes multiple states such as cat position, mouse position, mouse future path, how many steps the cat have made and for second heuristics state space also includes cheeses position. The cat position and mouse position are array lists stored in cat and mouse classes. As we known, the mouse future path, which is stored as array list in AI subclass. “How many steps the cat made” is stored in Node class. It is important for A\* search as it records the cost. In addition, it also important to get mouse position for mouse path.

The program has three heuristics function. The first one is calculating Euclidean distance from cat to mouse. This heuristic use Euclidean distance from cat to mouse as estimated cost to catch the mouse. It is not always optimal as if the mouse moving to the cat, the cat may spend less move to catch the mouse than distance between the cat and mouse.

The second heuristics is calculating Euclidean distance from cat to cheese. This heuristic use Euclidean distance from cat to the cheese that is closest from the mouse. As the mouse is always moving to the closest cheese. However, this is not always optimal, as if the mouse is closer than the cheese, the cat will not spend the distance from cheese to catch the mouse.

The third heuristics is using average of Euclidean distance from cat to the cheese and Euclidean distance from cat the mouse. This most likely solves problem optimally. Because, the disadvantages of those two heuristics are opposite. When the mouse move toward cat, which is bad for first heuristic, the closest cheese must close to the cat, hence, the average of both heuristics is more accurate. On the other hand, when the mouse is closer than the cheese, which is bad for second heuristic, the mouse must move toward other direction than toward the cat.

The program recorded searching time for different AI strategy. The average for BFS is 775000 nanoseconds. The average for DFS is 895400 nanoseconds. The average for first heuristic is 823400 nanoseconds. The average for second heuristic is 939300 nanoseconds. The average for third heuristic is 803400 nanoseconds.