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Competitive Analysis

**Ishikawa Watanabe Janken Robot (**[**https://www.youtube.com/watch?v=Qb5UIPeFClM**](https://www.youtube.com/watch?v=Qb5UIPeFClM)**)**

The University of Tokyo’s Ishikawa Watanabe Laboratory has developed a robot that can play rock-paper-scissors (*Janken* in Japan) against a human with a 100% win rate. The robot uses high-speed computer vision with a reaction time of 1 millisecond to identify the shape and position of the human hand and determine their move. Then it plays the winning move in 1 millisecond.

Technology to note: High-speed computer vision for determining the opponent’s moves.

**MIT Technology Review (**[**https://www.technologyreview.com/s/527026/how-to-win-at-rock-paper-scissors/**](https://www.technologyreview.com/s/527026/how-to-win-at-rock-paper-scissors/)**)**

Scientists at Zhejiang University in China studied 360 students playing rock-paper-scissors in 60 groups of 6 players each. On average, each student played each move 1/3 of the time. However, players who won tended to repeat their move the next round; players who lost tended to cycle through Rock-Paper-Scissors in that order.

Technology to note: form of machine learning? If hand loses, play hand next round to defeat previous round. Keep track of winning moves in a table and refer to it for next round.

**Daniel Lawrence Lu, M.S. in Robotics at CMU**

**(https://lawrence.lu/programming/rps/)**

There are multiple kinds of algorithms for rock-paper scissors:

Random-selection (randomly choose a move each round)

Fixed-move (play the same move each round)

Frequency-counting (count opponent’s moves, determine preferred move, counter move)

Rotation (use modular addition to cycle between moves each round, where each move is represented by a number)

Technology to note – could use one of these algorithms to control the prosthetic hand’s movements and improve winrate.