QCHACK 2021

CHALLENGE—MICROSOFT QUANTUM CHALLENGE

TEAM MEMBERS—

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PLAN PROJECT

SIMPLIFIED CLUEDO GAME WITH TWO PLAYERS

Our project was to use the Q# library and Grover's algorithm to solve a mystery in the spirit of the famous game Cluedo (Clue) Cluedo - Wikipedia. The game play involved two players, Classical Carl and Quantum Quinn. Gameplay is set up where a simplified board is created using arrays of clues and the QRNG from the MS samples.

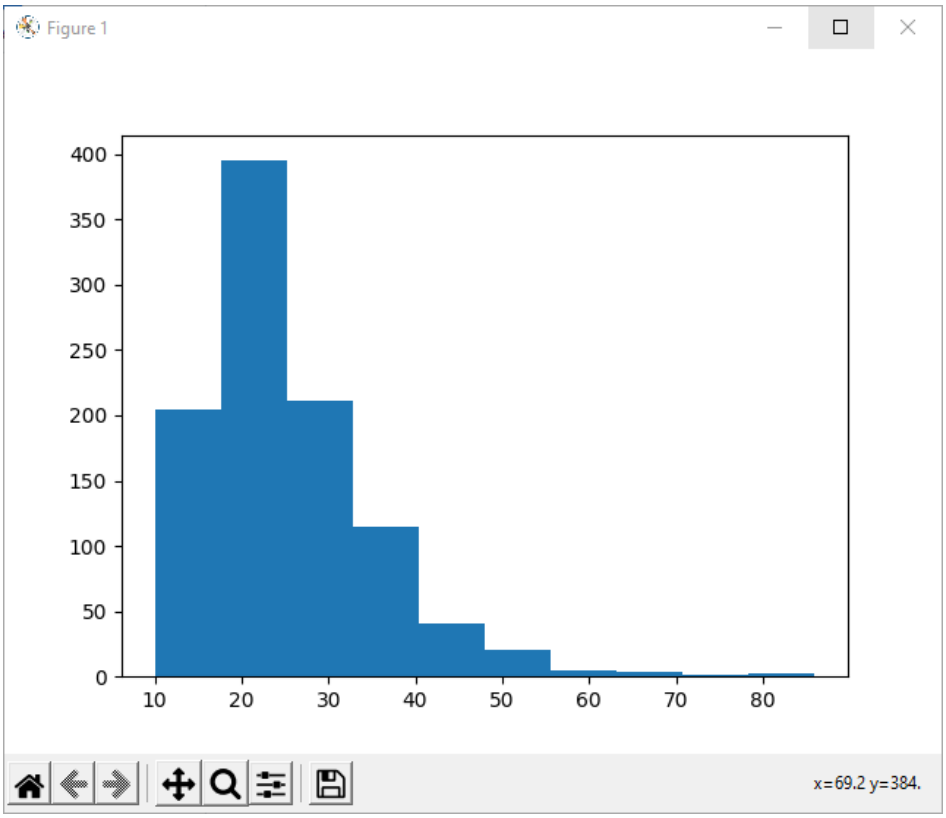
From the arrays, a single entry is chosen from each that represents the murderer, the room where the crime took place, and the weapon that was used. The following arrays indicate a possible crime scenario:

Guests = ["Colonel Mustard","Professor Plum","Mrs. Peacock","Miss Scarlet"]
Rooms ["Billiard Room","Conservatory","Study","Kitchen"]

Weapons ["Candlestick", "Rope", "Wrench", "Knife"]

Classical Carl took an approach where he could interrogate one guest at a time. With each interrogation, the guest provided a clue that was not involved in the crime. Carl would interrogate as many guests as was necessary to where the only clues not provided must solve the crime.

A distribution of Carl's required iterations shows a Poisson distribution with a median number of attempts near 30.



[We did not successfully implement the following part, but not for lack of trying]

Quantum Quinn was going to take a different approach. Rather than interrogate guests, she was going to attempt submit clues to the quantum crime solver. Using Grover's algorithm, constructive interference would let Quinn know if any clues provided had a high probability of being part of the crime. Iteratively, the probability of the three clues would increase until Quinn had high confidence the crime was solved. The alternate hypothesis was that Quinn would require fewer iterations than Carl to solve the crime.

Team conclusion: Although we still feel this would have shown a high probability of fewer iterations required, we need to build on our Q# skills before being successful. The project will remain open and if progress is made, we will update the Microsoft team of success.