

Part 1: Program Structure

For each command, there is a corresponding function to deal with different kinds of requests, and, additionally, this structure is much easier to maintain and add new features.

Part 2: Challenge and Solution

1. Message Flooding and Throttle

If the robot sends messages without a proper interval, the messages will be blocked by the irc server so that the messages cannot be sent successfully. This issue affected the "ip" function since it may generate several lines of output once the number string generates too many possible ips. My solution is that if the number of answers is more than 6, each message will be sent at an interval of 0.75 seconds. Therefore, all messages can be correctly sent without being blocked.

2. Multiple message in one 'recv' and race condition

If there are multiple requests coming simultaneously, the recv function may get multiple messages in one string, so the string has to be split according to the `\r\n` character. Also, the exception dealing is also important so that the robot won't be crashed by illegal inputs.

Part 3: Reflection

This homework gives us a chance to implement a simple chatbot on irc. Once our knowledge is stronger, we may be able to expand this homework to implement a better and more functional robot.