

# Chord Using Scala and Actor Model

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## Version:

1. Scala 2.11.7
2. SBT (the Simple Build Tool) 0.13.9
3. Akka 2.4-SNAPSHOT

## Running the code:

Follow these steps to run the code:

1. `cd` into the `proj3` directory.
2. Type `sbt` to start the interactive mode
3. Type `run <num of nodes> <num of request>` for inputs

## Structure:

The basic structure of both directories are shown as follows.

```
proj3
├─ build.sbt
├─ lib
├─ project
│   ├─ build.properties
│   ├─ Build.scala
│   └─ target
├─ src
│   ├─ main
│   │   └─ resources
│   │       └─ application.conf
│   │       └─ scala
│   │           └─ Pi.scala
│   └─ target
├─ test
│   └─ scala
└─ target
```

# Discussion:

## I. What is working

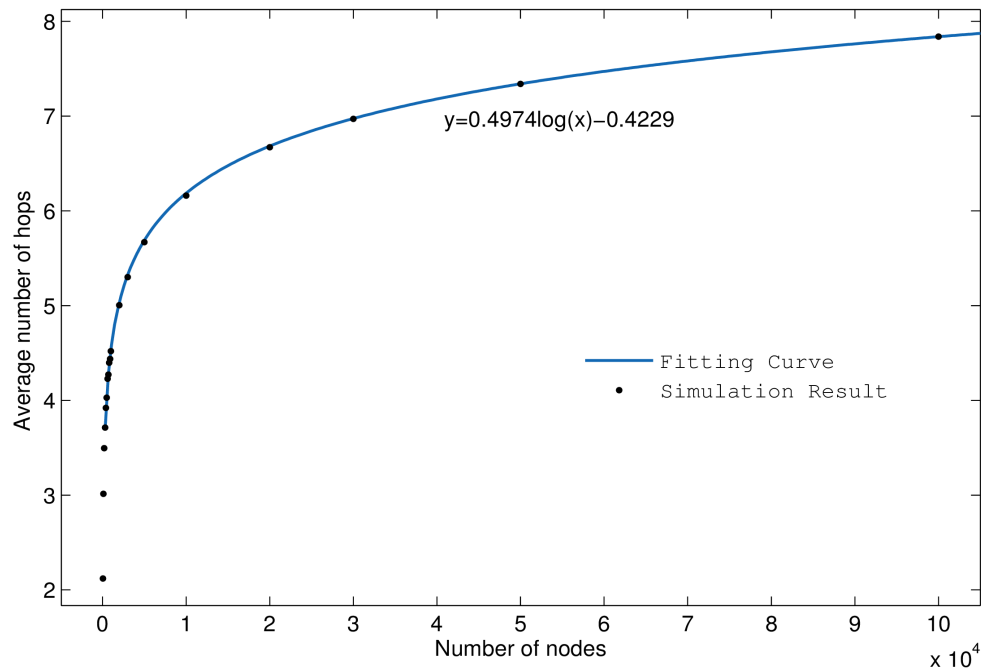
All functions according to the project requirement are working.

## II. Largest network dealt with

The largest network I managed to deal with is a  $10^5$  node network.

## III. Average number of hops

Below is a figure showing the number of nodes  $N$  in the chord network vs average number of hops. Being consistent in the literatures, the average number of hops is proven to be  $O(\log N)$ . The fitting average in the figure shows a great agreement with the simulation result with a  $R^2=0.9973$ .



# Chord Using Scala and Actor Model. Bonus

## Description:

In the bonus part, the simultaneous node failure is simulated. An extra argument is added in the input to specify the number of nodes that fail in the chord network. The output is then the lookup failure rate, which corresponds to a system that stores values with key but does not replicate the values or recover them after failures.

## Running the code:

Follow these steps to run the code:

1. `cd` into the `proj3bonus` directory.
2. Type `sbt` to start the interactive mode
3. Type `run <num of nodes> <num of request> <num of failed nodes>` for inputs

## Discussion:

Below is a figure showing the fraction of failed lookups as a function of the fraction of failed nodes. A linear relationship is observed as in the figure with  $R^2=0.9973$  for the linear fitting. This concludes that there is no significant lookup failure in the chord network due to the reason other than node failures.

