Undergraduate Research Summary Paper

MASS C++ enhancement to bring it in line with MASS Java

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Contents
Section 1: Description of my research project and specific goals ........................................... 2
Section 2: Discussion of my achievements during the quarter ................................................... 2
Section 3: Discussion of future work to be done ........................................................................ 3
Section 1: Description of my research project and specific goals

Work on bringing the MASS C++ library up to speed with the MASS Java library in terms of methods that provide performance improvements. Functionality that I was tasked with improving were:

- An asynchronous method doAll()
- Init(nAgents)
- Place Neighbor functionality
- onArrival() method in agent
- onDeparture() method in agent
- onCreation() method in agent

Section 2: Discussion of my achievements during the quarter

During this quarter I worked on comparing the C++ library to the Java library and implement doAll() methods:

```cpp
void doAll(int functionId, int numberOfIterations);
void *doAll(int functionId, void *argument, int arg_size,
             int numberOfIterations, int ret_size);
void doAll(int functionIdList[], int func_size, void *argumentList[],
           int arg_size, int numberOfIterations);
```

I worked on adding getter and setters that were missing in the C++ library classes, as well as neighbor functionality:

```cpp
vector<int *> getNeighbors();

enum neighborPattern {
    VON_NEUMANN2D,
    MEAD2D,
    VON_NEUMANN3D,
    MEAD3D,
};

public:
    void cleanNeighbors();
    void addNeighbor(int *);
    void addNeighbors(vector<int *>);
    void addNeighbors(neighborPattern pattern);

protected:
    void *getOutMessage(int handle, int index[]);
    void putInMessage(int handle, int index[], int position, void *value);

private:
    vector<int *> neighbors;
    vector<int *> getMooreNeighbors(int);
    vector<int *> getMeadNeighbors2d();
```
vector<int *> getVNNeighbors2d();
vector<int *> getMeadNeighbors3d();
vector<int *> getVNNeighbors3d();

After a meeting with Matt, I found out that the methods: onArrival(), onDeparture(), and onCreation() were actually java interfaces that allow the user to define methods for custom functionality. I believe that this functionality can be mimicked in C++ but must be done in a different way than in java due to the core differences between Java and C++.

Section 3: Discussion of future work to be done

The first part of work that I would like to do is improve the current state of the C++ library by merging the current branches into at most 2 working branches. Currently there are 14 branches on bitbucket, some of them with hundreds of conflicts with the current master branch. This work will take place during the fall quarter. During this process I will need to work with other students in the DS lab to test the master and development branches to ensure the merges do not adversely affect the performance of the MASS C++ library.

Upon completion of merging and refining the branches of the library, I would like to assist the students working on MASS applications to edit an application to test the new functionality that I worked on implementing this summer to check for improvements in functionality and perhaps ease of programming.