This is to be a working drive for the 2018 SURE project on TB ABMs using FLAMEGPU

I suggest we keep brief notes here of meeting outcomes and what’s being worked on

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Day 1: suggested

* practicalities, working location & resources, meeting tempo
* FLAME GPU resources and relevant examples to work through
* discuss one aspect of population modelling and work on coding up
* other thoughts?

*Meeting Pete@ 10 for 30 mins*

*Meeting Pete & Mozhgan @ 14 for 30 mins*

*(both rm 2004)*

**10am, Monday 11th June**

Normally Flame GPU is used with a static XML file describing the population which is then used for iterated simulations, whereas we want to create the population using Flame GPU itself and then simulate based on that population, so our distribution covers all relevant variables.

First problem is, given data containing information about the number of people in various sex/age categories and the number of households of particular sizes, assign each person to a household to create a sample population.

Can do this by dividing the output table into blocks, then the first section will be an identity matrix as we can reorder the people arbitrarily, with the remaining sections being Latin hypercubes.

**2pm, Monday 11th June**

Flame GPU branch v1.5 contains features like host agent creation which will be necessary for the project, but for now we should work with the master branch and the given examples to become more familiar with how the system works.

First thing to work on is the tutorial sheet on the Flame GPU website using the predator prey model as an example, to get used to compiling and running the Flame GPU code and writing in C to add my own features to the model.

Can get help with Flame GPU from the PhD students in the graphics research lab, and example code can be compiled and run from within Visual Studio on the Windows machine there.

**9am, Friday 15th June**

The approach used to assigning people to households works fine, although it should be tested to make sure that the assignment output matches the original histogram that was used as input.

Need to try and get an understanding of how Flame GPU works, for example where the XML file is generated from and eventually how the iterations are run and a visualisation is produced.

Eventually, should look at the host agent creation in the new version of Flame GPU as this will be relevant for our project, when we generate our population before running the simulations.

**Weekly Reflective Log, Week 1**

The first week of my project has gotten off to a good start. I coded up a solution to a small problem relating to the project, that assigns people in various age and sex categories to households of various sizes, and started off getting to grips with Flame GPU which is the tool I will be using as the project moves forward. I need to make sure that I manage my time effectively and develop a good understanding of the various factors relevant to the project, so that my solutions stay applicable to the real life problems we are trying to solve. Next week I will try to add more factors to my code simulating people in households and also develop a better understanding of how Flame GPU functions.

**2pm, Monday 18th June**

Managed to get the test functioning so that the households algorithm definitely produces an output corresponding to the data that was input, and the right number of people is assigned to each household.

Next major problem will be understanding the various types of building that people visit on a daily basis and incorporating these into the simulation, with some being buildings that people tend to visit at the same time each week and some being buildings that people visit sporadically.

Also need to look at close contact between people in the community and the factors affecting it, for example how people within an age category tend to primarily interact with people in the same age group.

**2pm, Tuesday 19th June**

Got a much better understanding of how projects are created within Flame GPU, including the folder structure and how files should be arranged, and initialised my own project using dummy code from one of the examples.

The host agent creation example mostly makes sense except for some parts where memory is allocated for creation of agents, which will take some more time to get to grips with due to lack of experience with the way memory is allocated in C.

Should implement an example program where agents have an age and a probability of death proportional to their age, as this will have a known result so we can test if the host agent creation is working properly.

**2pm, Wednesday 20th June**

Program with aging and probability of death that scales with age has been implemented, although the existing birth rate makes it difficult to see the effect that changing the parameters has.

Should change the name of death probability to time step as this is a more accurate representation of what the variable means, and get rid of the birth rate so that the effects of changing parameters are clearer.

Also, should try to get a sense of how efficiently the program runs, by trying to calculate the amount of time taken per agent per time step, so that we can get a good benchmark for how fast the final project will be able to run.

**2pm, Thursday 21st June**

Program with aging and probability of death that scales with age is complete, and graphs generated from the results with a large enough number of people show that the results match up with what would be expected analytically.

Next major goal is to translate the code for households that has already been written in Python into C, which should not be too difficult as the majority of the necessary code already exists.

After that, buildings will be added to the model such as schools and churches where people will visit at different times throughout the week, so that they will transmit the disease as they meet people on the way.

**Weekly Reflective Log, Week 2**

Throughout the second week of my project I have been continuing to make good progress. I have now spent time getting to grips with the Flame GPU software and have developed a model where people age and die that is consistent with the theory. I will continue to try and make sure that I am managing my time effectively, so that I can keep a good rate of progress and make sure that I am keeping on top of everything that I need to do, and that I am on track to have a finished and functioning project by the end of the six weeks. Next week I will be concentrating on incorporating the households code into my current model and then starting to add additional buildings for more detail.

**Weekly Reflective Log, Week 3**

Unfortunately, my supervisor has come down with pneumonia, so I haven’t been able to meet with him for the majority of this week. This has made it more difficult to keep up with the things I need to do, but I think I have been managing well enough and keeping on top of things as best I can. Over this week I have implemented both households and churches into my model, so good progress has been made towards having a thorough model of tuberculosis transmission. Next week I will be trying to develop a system where time passes over the course of a week and people visit the various buildings, and hopefully my supervisor will recover so I can benefit from his input.

**2pm, Monday 2nd July**

Program now generates households and churches and allocates people to households and households to churches in the way specified in the parameters document.

Next major goal is to develop a system where time passes in intervals of 5 minutes, and each person agent is in a particular place at every given time, for example at home or at church.

Can also start on developing system for generating transport, which will be similar to churches but person based instead of household based, and will depend on different factors.

**Weekly Reflective Log, Week 4**

My supervisor has recovered from his illness now, and so we’ve been able to continue with the project and catch up to where we are supposed to be in our schedule. Over this week I have implemented public transport into the model, and also developed the system where people move to different places over time and the time that they spend in these places is recorded, which will be important for our final results so we can keep track of people as events happen to them. Next week I will be starting to develop the system where tuberculosis is transmitted between people at different places and at different rates depending on their demographics.

**Weekly Reflective Log, Week 5**

Now that we are nearing the end of our project, things are getting a bit more stressful and I am having to manage my time better to make sure that we get everything done that we need to do, but we should still be on pace to finish the project on time. Over the last week I’ve finally implemented the infection process so that we can get some useful results out of our model as well as implementing some new buildings such as workplaces and schools to make it a bit more realistic and fully featured. Next week in the last week of the project I’ll be adding features so that we can run the simulation several times with different parameters, so we can hopefully get some interesting results out of it.