Parallel Design Patterns 1

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1(a). The first pattern we recommend for this problem is the **Actor Pattern**. We make this suggestion as the problem domain can be expressed as entities, which map, on a 1:1 basis, to actors. These actors are squirrels, grid cells and squirrel master. Squirrels and grid cells have a one to one mapping with the functionality described in the details of the biologists model, i.e. a grid cell will have a populationInflux value. This mapping is a notable advantage as it will make it much easier for biologists to understand the final code. We also have to oppourtunity to reuse the biologist's function to map the x,y location to a grid cell number, and make that grid cell number the rank of the grid process in an MPI implemenation.

- **Squirrel**
  - Values
    - `location` - x,y co-ordinate which can be resolved to grid cell.
    - `infected` - A boolean value to indicate if a squirrel is infected with the parapoxvirus or not.
    - `liveness` - A boolean to indicate if the squirell is alive or not. This helps us prevent us from moving dead squirrels.
  - Functions
    - `get_grid_cell()` - Returns grid cell value from `location`. The biologists have already supplied us with this function.
    - `move()` - Updates location and sends a message to a grid cell to inform it to increment its `infectionLevel` and `populationInflux`. A squirell can move to the same cell, and moves once every step.
- **Grid cell**
  - Values
    - `infectionLevel` - Total number of infected squirrels in
  - Functions

The squirell entity can be perfectly encapsulated. It does not need any information about any other squirells, and therefore does not need to share

state with them. A squirell does need to gain information from the grid cell it occupies every 2 and 3 months, but this can be done easily enough through message passing. I.e. At a certain interval, the squirrel quiries the grid cell it occupiees for the populationInflux value, or infectionLevel value