Introduction
Guardian Angel Concept
• Current social networks usually have a very dense network structure where each individual has a very large number of connections. However, this means individuals are less likely to stay in contact with others.
• The Guardian Angel concept provides a network where individuals are in charge or focused on specific users to help them achieve their goals in a specific domain.
• The Guardian Angel Concept involves:
  • Child – Individual who is pursuing a goal
  • Guardian – Individual who is responsible for providing support and monitoring an assigned children with their goals

eGuardian Angel Mobile Application
• An eGuardian Angel mobile application has been developed based upon the Guardian Angel concept where individuals are assigned children which they monitor using:
  • Messages between guardian and child
  • To do lists
  • Reminders
• In the eGuardian Angel application network, users are both guardians and children, and in this case, the guardian to child ratio is one to one.
• Every user in the system is pursuing a goal and is assigned another user as their guardian for support for their goal.
• This application is still in its early stages and the effectiveness of it is unknown.

Aim/Motivation
• To model and simulate the eGuardian Angel mobile application to determine important parameters for a basis for future development.
• To determine what types of groups would benefit from the application and the most ideal guardian to child ratio which would provide the most benefit to users.
• This information will influence the emergence of social pattern formation and will show how these parameters impact individuals and social benefit.

Background
Agent Based Simulation
• Type of simulation where autonomous agents are defined to model a complex system.
• Allow detailed agents to be defined to model the diversity of agents involved and observe effects at a macro level.
• Generally have 3 elements:
  • Agent relationships
  • Agents defined by their attributes and behaviours
  • Agents’ environment

Design
Network
• The network modelled is a directed graph, $G(N, E)$, consisting of the set $N$ of nodes representing users and the set $E$ of edges representing the relationship between users, which are ordered pairs of elements of $N$
• An edge $E(u, v)$ would indicate $u$ is a guardian of $v$ and in this
• Since each user is both a guardian and a child, and the guardian to child ratio is one to one, it results in the following network:

Agents
• The attributes of an agent are defined as follows:
  • Positivity indicates the effect the user will have on their children
  • Motivation indicates how motivated they are to achieve their goal
  • Behaviour
    • Given $p$, the probability of a child receiving a message from their guardian and $p_{guardian}$ the positivity of a guardian:
      $$p_t = \frac{p_{guardian}}{1000}$$
    • If a message is received by their guardian, the users new motivation
      $$m_{new} = (m \cdot \frac{p_{guardian}}{m} \cdot 0.01) + 1$$
    This causes the motivation of the child to tend towards the positivity of their guardian according to their motivation so that motivation that has a higher difference to their guardians positivity will tend faster.
    • Over time, an users positivity will be influenced internally by their motivation through:
      $$p_{new} = p \cdot \left( \frac{m - p}{p} \cdot 0.0025 \right) + 1$$
    This will also tend positivity by motivation through the same principle

Environment
• A random factor is used to model the environment influence which adjusts the user’s motivation 0.1% of the time.
• It is obtained from the Gaussian distribution $\mathcal{N}(\mu, \sigma)$, where $\mu$ is the mean and $\sigma$ is the standard deviation.

Experiments
• Experiments are completed through 5000 steps and are repeated 10 times with the averages and standard deviations recorded

Future Work
Field Studies
• Field studies can be completed on the eGuardian Angel mobile application to obtain statistics on the users and use of the application so the can be fed into the simulation and obtain more accurate results.
• This data can be used to more accurately set parameters in the simulation and define agent behaviour.

Network Structures
• Simulations could be carried out on different network types such as centralised and modular, and networks of different number of components.

References