**I Introduction**

**1 Introduction and background of language**

Unified modeling language (UML) is a general-purpose visual modeling language, description of software is utilized to, visual processing, structure and the establishment of documentation of software products. It records the system decision of must be constructed and understanding, can be utilized in the understanding of the system, design, browse, configuration, maintenance, and information control. UML is applicable to a variety of software development methods, software life cycle stages, various application fields and development tools. UML is a summarized previous modeling experience and absorb the excellent achievement of today's standard modeling method. The semantics of UML, including concept, representation and illustration, provides the static, dynamic, system environment and organizational structure of the model. It can be supported by interactive visual modeling tools. These tools provide a code generator and report generator. UML standard does not define a standard development process, but it is suitable for the iterative development process. It is a process to support most of the existing object-oriented development and design.

UML to describe the static structure and dynamic behavior of a system. UML describe the system as the interaction of some discrete objects and eventually the function of the external users provides certain model structure. Static structure defines the important attributes of the object and the operation of the system as well as the relationship between these objects. Dynamic behavior to define the time characteristic of the object and the object to accomplish goals and mutual communication mechanism. From the angle of different but interrelated system model can be used for different purposes.

UML includes model can be decomposed into the package structure components, so that the software team will be a big system is decomposed into a block structure, is easy to deal with and understand and control the dependencies between packages in a complex development environment management model unit. It also includes used to display system implementation and organizational operation of the component.

Using traditional programming languages such as Cobol and Fortran language appeared in the 1970 s, software development method is widely used in the 80 s, the most important of these is structured analysis and structured design method [Yourdon - 79] and its variants, truthfully the structured design method [Ward - 85], etc. These methods initially by Constantine, Demarco, Mellor, Ward, Yourdon and others invention and promotion, in some large systems, especially in the field of aerospace and defence and the government signed a contract system has obtained certain breakthrough, in these systems, the government officials stressed the development process of presided over the project design document complete and fully organized and development. The results are not always as good as expected - many computer aided software engineering (CASE) is extracted some of the implemented system design report generator - in spite of this, these methods still contains some good ideas, sometimes in some large system is very effective. Commercial application software is more reluctant to adopt large CASE system and development methods. Most commercial enterprises independent development of the enterprise internal use software, there is no opposite relationship between customers and contracting people, and this relationship is characteristic of large government projects. It was generally supposed that the commercial system is simpler, whether this view is correct, anyway, it does not need to after the inspection of the organization.

Is generally believed that was born in 1967 in the Simula - 67 was the first object-oriented language. Although the language of many later object-oriented language design had a great effect, but it does not have any successor. Smallpox in the early 80 s, the wide use of the language set off a "object-oriented movement", then gave birth to the object-oriented C, C + + language, Eiffel and CLOS. At first, in spite of object oriented programming language has a certain limitation in actual use, but it still has attracted extensive attention. In small talk language become famous for about 5 years later. The first to introduce the methods of object oriented software development books appeared. Including Shlaer/Mellor [Shlaer - 88] and Coad/Yourdon [Coad - 91], then have the Booch [Booch - 91], Rumbaugh/Blaha/Premerlani/Eddy/Lorensen [Rumbaugh - 91] and Wirfs - Brock/Wilkerson/Wiener [Wirfs - Brock - 90] (note: the book rights s often includes one year after the July book). These works plus Goldberg/Robson [Goldberg - 83] Cox [Cox - 86] and Meyer [Meyer - 88] relating to the programming language design works, created the precedent of object-oriented method. After the first stage in late 1990. Later published [Jacobson - 92], it is based on the basis of previous achievements, this paper introduces a slightly different approach, which centered on the use cases and the development process.

In the next five years, a large number of books on object-oriented methods, each have their own a set of concepts, definitions, representation, terminology, and suitable development process. Some books put forward some new concepts, but on the whole the concept used by the author. Many subsequent book from predecessors, oneself do small expansion or modify again. The first author was also not idle, most of them are updated his early work, adopted the others some good ideas. In a word, there have been some widely used core concepts, and the concept of a large number of adopted by individuals. Even in the core concepts of widely accepted, in the object-oriented approach also have a few small differences. These small comparison between object-oriented method often make a person feel the concept on the basis of which is good, especially the non-specialist reader.

Unified Modeling Language (UML) is also called the Standard Modeling Language, it is an OMG standard began in 1997 and a support system Modeling and software development of graphical Language, for all stages of software development provide Modeling and visualization support, including from requirements analysis to the specifications, the structure and configuration. Object oriented analysis and design (OOA&D, OOAD) method of the development in the late 80 s to 80 s there was a climax, UML is the product of the climax. It not only unified the Booch, Rumbaugh and Jacobson said method, but also for its further development, and finally unified standard modeling language accepted by the public.

The unified modeling language (UML) is a standard marker used to modeling the real world objects. The modeling process is the first step in the development of object-oriented design method. Its market is originated from and unification on the basis of three kinds of object-oriented design and analysis method of tag:

① Grady Booch's description of the collection of objects and the methods of the relationship between them.

② James Rumbaugh objects modeling technology (OMT).

③ Ivor Jacobson including uses case method.

There are some other ideas also played a role in UML. UML is Booch, Rumbaugh, Jacobson. UML has been approved by the object management group (OMG) as the standard, the group also made the common object request broker architecture (CORBA), distributed object programming industry leader. Computer aided software engineering (CASE) products suppliers also support UML. And it has been basically all software development products manufacturers, including IBM and Microsoft VB environment (for it). UML specification describes the modeling concept, class (object), object, relevance, responsibilities, behavior, interfaces, cases, bags, sequence, collaboration, and the state.

**2 Main Content**

UML is the Booch, OMT and OOSE object-oriented method and many other methods and developed on the basis of the data.UML notation on the different methods of graphical representation, eliminated which easy to cause confusion, redundancy or rarely used symbols, and added some additional symbols. The concepts from many experts in the field of object oriented technology.

UML starting from the unique point of view of system, defines the use case diagram, class diagram, object diagram, state diagram, activity diagram, sequence diagram and collaboration diagram, component diagram and deployment diagram 9 kinds of diagrams. The figure of the system is described from different sides. System model will be integrated into a coherent whole. These different sides to facilitate analysis and structure of the system. Although UML and other development tools can design out any derived from view, but these diagrams and other supporting documents are software developers can see the basic structure. Among them,:

① UML use case diagram and a use case diagram of OOSE is similar.

② The UML class diagram of the integrated OMT, Booch class diagrams in object oriented method, etc.

③ UML state diagram is to David crushed state diagram of proposed improvements.

④ Basic semantics of UML activity diagram and state diagram is roughly same. It is similar to a number of methods (including some of the ways) prior to the object-oriented technology in the workflow diagram.

⑤ UML collaboration diagrams are through to the Booch method object graph, the fusion method of object interaction diagrams, and a number of other related graphic transformation in the way.

⑥ The construction of the UML diagram and deployment diagram is a module in the Booch method and process diagram (diagram, processor) developed on the basis of.

UML modeling method simplifies and its substation Booch, OMT and OOSE method of dregs, and replace it with other methods in essence. UML is generally not the introduction of new concepts and symbols, only when there is no existing solution can draw lessons from, developers to consider joining the modern concept of UML. UML is the developers in the design of a kind of language (though only a graphical language), and therefore must be concise, all elements are expressed in the box and text) and red (for each element design separate symbol) between the trade-offs. UML, though, or add to the intensification and extension mechanism, some new elements, because these elements in other modeling language (UML) have proven to be very useful in practice.

⊙ Use Case diagram is mainly used to describe the relationship between the users, requirements, system function unit. It shows external users can observe system function model diagram. Its purpose is to help the development team in a visual way to understand the functional requirements of the system.

⊙ Class diagram shows a set of classes, interfaces, collaboration, and the relationship between them. In UML problem domain to eventually be gradual transformation, modeling by a class, through the programming language to build these classes so as to realize the system. Class, the relationship between them was added to make up the class diagram, class diagram, package can also include interface elements, such as can also include the object, such as chain instance.

⊙ Object Diagram is showing a set of objects and their relationship. Use object diagrams to illustrate the data structure, class diagrams in the class or component such as an instance of a static snapshot. Object and class diagrams reflect system static process, but it is from the actual or prototype scene to express. Object Diagram shows some point to the relationship between the object and the object. An object graph can be seen as a class diagram of special cases, instances, and classes can be showed in it. Objects and also cooperation figure, figure display in the context of object prototype (class). Object Diagram is an instance of the class diagrams, is pretty much the same with the class diagram of the logo. Their difference lies in the object graph showed multiple object instances of a class, rather than the actual class. An object diagram is an instance of a class diagram. Because object life cycle, so the object graph can only exist in a certain time period system.

**3 Characteristic**

(1) The UML unified methods for different types of systems, different development stages and different point of view of the concept of different internal effectively eliminates unnecessary differences between various modeling languages. It is actually a kind of universal modeling language (UML), for many users widely use of object-oriented modeling method.

(2) The ability of UML modeling object-oriented modeling method is stronger than others. It is not only suitable for the development of the general system and modeling of parallel and distributed system is particularly appropriate.

(3) The UML is a modeling language, rather than a development process.

**II System contents**

Ant colony algorithm, also called ant algorithm, is a kind of used to type the probability of finding optimal path algorithm in the picture. It by Marco Dorigo in 1992 in his PhD thesis is put forward. Its inspiration from the path in the process of ants searching for food. Ant colony algorithm is a kind of simulated evolutionary algorithm. Preliminary studies show that the algorithm has many good properties. For PID controller parameters optimization design problem, the result of the ant colony algorithm was designed with the genetic algorithm by comparing the results of the numerical simulation results show that the ant colony algorithm is a new kind of simulated evolutionary optimization method is effective and applied value.

**The scope**

Ants observed range is a world square, ants have a parameter for speed radius (usually 3), so it can observe the range is 3 \* 3 grid world, and can move distance is within this range.

**The environment**

Ants in the environment are a virtual world, there are obstacles, there are other ants, and pheromones, information has two kinds, one kind is to find food in the ant pheromone, one kind is found in nests of ants in nest of pheromones. Each ant can only perceive it within the scope of the environmental information. Environment make pheromone disappear at a certain rate.

**Foraging rules**

In the range of an ant can perceive to find whether there is food, if you had it directly in the past. Or look at whether there is information, and to compare which point within the scope of the senses is the most pheromone, in this way, it is more than the pheromone, and each ant small probability to make mistakes, so as to not move up to the pheromone. Ants nest finds rules and as above, but it responds to nest of pheromone, and response to food pheromones.

**Mobile rules**

Each ant moving towards the direction of the pheromone most, and, when there is no guidance pheromone around, ants will be in accordance with their original motion inertia in the direction of the bottom go to, and, in the direction of the movement has a small random disturbance. In order to prevent ants circles, which point it will remember just passed, if considered to go before the next point has been passed, it will avoid as far as possible.

**Rule of obstacle avoidance,**

If there are obstacles blocking the direction of the ants to move, it will randomly choose another direction, and have the pheromone guide. It will be in accordance with the rules of foraging behavior.

**Rules of pheromone**

Just find food or an ant in the nest "at the time of the most pheromone, and follow its distance, spreading pheromones are fewer and fewer.

According to the rule, and there is no direct relationship between the ants, but each ant interact with the environment, and through the pheromone this bond, actually the links between individual ants. When an ant finds food, for example, it does not directly tell other ants have food here, but to the diffusion of environmental information, when other ants passing near it, can feel the presence of pheromones, and according to the guidance of pheromone found the food.

**The characteristics of ant colony algorithm:**

1) Ant colony algorithm is a type of self-organizing algorithm. In system theory, self-organization and its organization is the organization's two basic classification, the difference lies in the organization or group instruction is from within and from the system of the external, from the internal system is the organization, from the system, his external organizations. If the system of space, time or function of the structure of the process, no specific intervention of the outside world, we said is self-organizing system. In the abstract sense, since the organization is under no outside causing the system entropy decreasing process (i.e., is the change of system from disorderly to orderly process).Ant colony algorithm fully embodies the process, for example with ant colony optimization. When algorithm to start early, single artificial ant disorderly looking for solution, algorithm after a period of evolution, through the role of pheromones between artificial ants, spontaneous tend to look for the more and more close to some of the solution of the optimal solution, this is a disorderly to orderly process.

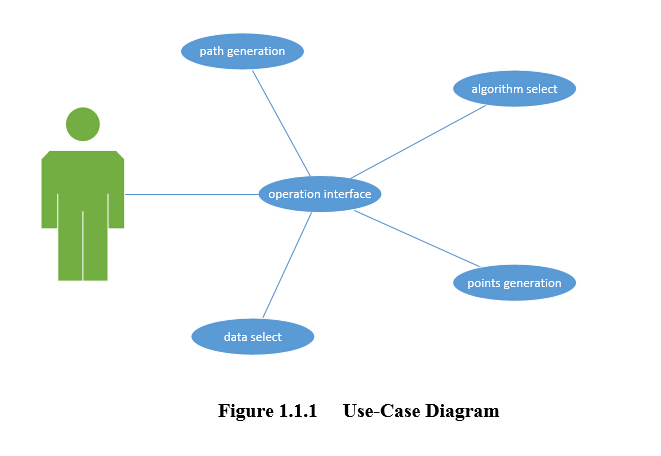
2) Ant colony algorithm is a type of parallel algorithm in nature. An ant search processes independent of each other, only by pheromones to communicate. So the ant colony algorithm can be regarded as a distributed multi agent system, it is in the problem space more began to independently search solutions at the same time, not only increase the reliability of the algorithm, also makes the algorithm has stronger global searching ability.

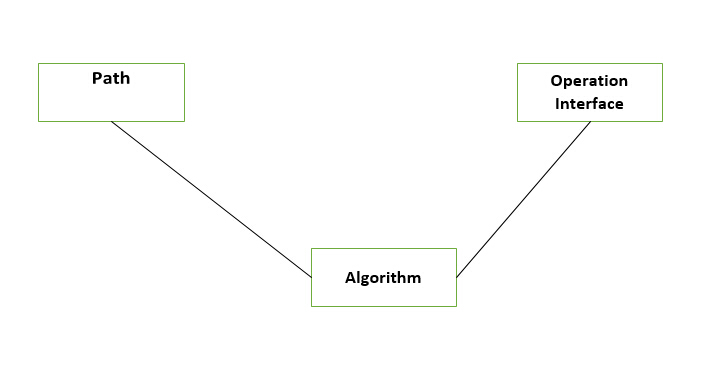
3) The ant colony algorithm is a kind of positive feedback. From the process of real ants foraging we see not hard, the ants will eventually find the shortest path, directly depends on the accumulation of pheromones in the shortest path, and the accumulation of pheromones is a good feedback process. For ant colony algorithm, the initial time exactly the same information in the environment hormone, give the system a small perturbations, makes the concentration of trajectory on the side of each are not identical, solutions are the advantages and disadvantages of the structure of the ant algorithm USES the way of feedback is left in the optimal solution through the path of the hormones, more information and more information of hormone and attracted more ants, this process of positive feedback makes different initial constantly expanding, and guide the whole system to the optimal solution in the direction of evolution. Therefore, positive feedback is an important characteristic of ant algorithm, which makes the algorithm evolution process.

4) Ant colony algorithm has strong robustness. Compared to other algorithms, ant colony algorithm on the initial route request is not high. The ant colony algorithm of solving the result does not depend on the initial route choice, and need no manual adjustment in the process of the search. Secondly, less number of the parameters of the ant colony algorithm, simple to set up, easy to ant colony algorithm is applicable to the solution of the other combinatorial optimization problems.

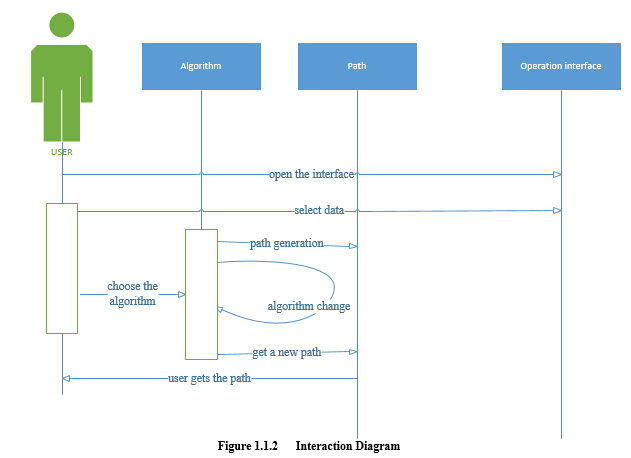
**Use case View**

There is no significant risk associated with any of the additional requirements. Therefore, the design will incorporate all the above requirements.

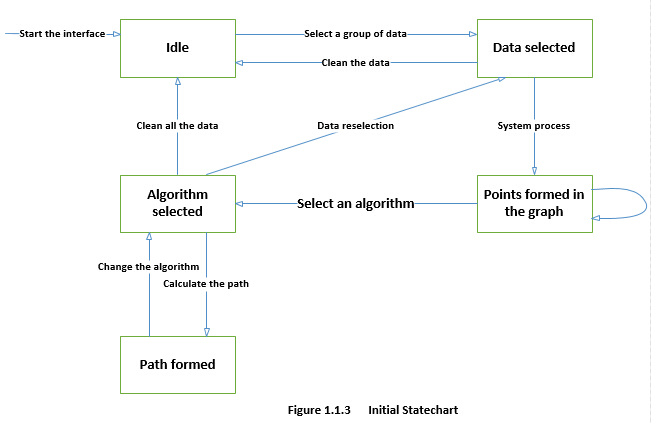


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**Interaction Diagram**



**Initial Statechart**



**III Analysis and Conclusion**

Through the experiment and application, although established goals has been completed, but due to the complex and profound Ant colony algorithm and UML, we still have a lot of things to continue to study and I will do my best to continue to study.