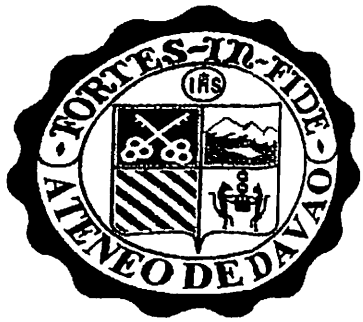
Design and Develop Traffic Simulation Using XNA 4.0



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Design and Develop Traffic Simulation Using XNA 4.0

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ABSTRACT

Traffic simulation through software application can be a medium to better help, plan, design, operate and implement transportation systems. It involves movements of cars to different roads and intersections in accordance with the sequential flow of the traffic lights. Sequential flow of traffic lights involves a holistic approach in algorithms in which it involves order and efficiency. Traffic simulations are not new to us since it already exists for almost forty years. The only thing that is interesting and beneficial in this simulation is its innovation throughout the years in terms of functions and environment.

The study is all about traffic simulator in MacArthur Highway – Sandawa Road Intersection. The simulator will be implemented in Visual Studio 2010 C# programming language with Microsoft XNA 4.0 libraries. The traffic simulation will simulate traffic flow and motion of cars based from data gathered and collected from the TMC. The study is limited in simulating the traffic flow along MacArthur Highway – Sandawa Road Intersection and will not show and display alternative routes and shortest paths. Instead, it will predict and simulate the data applied to the road of MacArthur Highway – Sandawa Road Intersection.

Keywords: C#, Microsoft XNA 4.0, Traffic simulation, Graphical representation

CHAPTER 1

INTRODUCTION

1.1 Background of the study

The project is about the MacArthur Highway – Sandawa Road Intersection traffic graphical representation. We had come up to this kind project to address the traffic issues of the City. Since we are in the field of technology, we want to develop a simple yet functional traffic graphical representation that illustrates the traffic scenario of a particular road in the City. Through this project, we will be able to learn and appreciate how the traffic in the City can affect the day-to-day transactions and activities of each and every individual, passengers and motorist.

The main tool used for this project is the XNA 4.0.since it is compatible with all the versions of the Windows platform, which is one of the most common platform that is convenient to use nowadays. We used XNA 4.0 since this tool is one of the tools that has all the available resources in the internet that can help us in developing such a project from its design to its implementation. The tools also have built in device objects and graphic device scalars, which can help us in data analysis and manipulation with the use of numerical figures. The XNA 4.0 tool has been implemented with the use of Microsoft C# which we have chosen to use because of its object oriented approach.

1.2 Technology Application Context

The traffic graphical representation is one of the most commonly used tools in planning and measuring what will be the outcome on a certain event. There are a lot of graphical representations in this world from medical field to safety measurements to industrial environment and crowed simulations functioning differently depending upon its environment to be use. Of all the simulations in different fields has aim, which is to predict the outcome if it happen in reality.

Our main goal is a purposely build traffic graphical representation in Davao, this graphical representation is to predict the density of traffic at the intersection of a road in a graphical way. This graphical representation will have a feature that allow user to manipulate data specifically time and day which will enable to show the density of cars passing at the intersection and simulate the flow of that data. Also the representation will show normal traffic flow base on actual scenario on the intersection.

This research will focus on creating graphical representation of traffic. The main instrument of creating such representation is the Microsoft XNA 4.0 framework using C# programming language such as implementing roads, intersections and motion of cars to support the actual data to be simulated. However, there will no databases that will be used in the project because it irrelevant to our representation due to the fixed and limited data. All data and algorithms is embedded in the hard coding itself.

1.3 Objective of the study

The objective of this project is to create and develop a graphical traffic simulator in such a way that it can be easily illustrated and interpreted by the user. Graphical representations are the key components in creating the project in order for it to be user friendly and conceptually detailed. The project will have a different approach as to how it will be created and implemented through trial and error system. The challenge of this project is for us to make way for it to be timely and beneficial as possible through extensive research. The project should be holistic as possible in such a way that it can address the needs of stakeholders in view of the traffic situation that will create a solution for the City of Davao.

- To have limited, specific and well defined time and scope of the project (Bangkerohan – McArthur Highway)
- To have a real time, consistent and accurate data gathering from TMC which includes time interval
- To adapt a technical, informative and creative approach on the project's input, throughput and output using logical theories, program design and data implementation
- To conduct series of observations and test within specific range of time and days.

1.4 Significance of the Study

The traffic representation will help regulate and control road traffic in MacArthur Highway – Sandawa Road Intersection. Through this representation of traffic, City government can make some measurement in addressing the traffic issues. This project will be helpful to individual drivers, business sector and even to the government sector to be informed about the road traffic at a certain time or at a certain day. As a result, drivers can have an effective and efficient time dealing to their daily routes' goal especially during rush hours.

The user will choose a time and day he / she want to simulate to know how heavy or light the traffic condition during the chosen time and day. This traffic representation can have a better orientation to the people on the innovating technology in the field of transportation. The project will gain both microscopic and macroscopic traffic representation advantage such as the estimated duration of time that the cars travels and, the number of cars passing by a lane or intersection in which will simulate traffic condition in a given time by creating traffic models and implementing traffic plans.

1.5 Scope and Limitation

The simulator will illustrate traffic flow and motion of cars along MacArthur Highway – Sandawa Road Intersection. The representaion will simulate the cars passing by the highway. The actual sequence of the traffic light will be included and actual road path of the cars. The representation will depend on the input upon user's assumption according to time and day in which it wishes to simulate. The representation then illiustrate the density of traffic given by the user from the time and day he/she chooses and where that density will be add on the road path: Bangkerohan – MacArthur, vice versa, Bangkerohan – Sandawa vice versa, Sandawa – MacArthur vice versa.

However, it will not illustrate people passing by the street, along pedestrians, and this representation cannot show shortest path and alternative route to take. The simulator will represent a perfect car path based to the road lanes. It will not simulate car changing lanes and cars that overtake. It will not illustrate car colliding to other car and it will not illustrate a jeep loading and unloading passenger.

1.6 Definition of Terms

- Simulator - software which displays real-time events through GUI representations.
- GUI (Graphic User Interface) – A user interface based on graphics instead of text which uses mouse and keyboard as an input device.

- IDE (Integrated User Interface) – software use to develop application.
- Data – raw information
- Processed data- information
- C# - multi-paradigm programming language
- Visual Studio - is an integrated development environment (IDE) from Microsoft
- Microsoft XNA 4.0 – is a library that helps developer create games, applications and media for Xbox, Xbox 360 and Microsoft Operating System.
- Simulation - the technique of representing the real world by a computer program; "a simulation should imitate the internal processes and not merely the results of the thing being simulated"
- Traffic - the aggregation of things (pedestrians or vehicles) coming and going in a particular locality during a specified period of time
- Road intersection - a road junction where two or more roads either meet or cross at grade
- Traffic Representation- planning, designing, operating and implementing transport systems through software application
- Transportation- movement of cars from one location to another

- Macroscopic Traffic Representation- also called continuous flow representation, mainly used in traffic flow analysis
- Microscopic Traffic Representation- represents each and every vehicle passing the roads and intersections
- Traffic Model- illustrating traffic relationships such that relationships are interrelated with each other
- Speed- is defined as the distance covered per unit time

FORMULA: $$v_t = (1/m)\sum_{i=1}^{m} v_i$$ where m represents the number of vehicles passing the fixed point

- Density- defined as the number of vehicles per unit area of the roadway.

FORMULA: k = 1 / s where k= number of vehicles per unit area

S= distance between two vehicles