

Simulation and Modeling

Project Proposal

Project Name

Artillery Forward Observer Training
Simulation

Group

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Intoduction :

In our project we want to simulate a technique used in army which is the Forward Observer (we will called him from now **AFO** abbreviated for Artillery [المدفعية تحديداً] Forward Observer) we will give a brief description about him later in this proposal.

We intend to use OpenGL in C# language since the project may or must contain some 3D graphics to give the clear idea about the **AFO**, the 3D graphics will contain a battle field terrain and some targets.

Brief description about AFO :

Artillery works in groups, The Forward Observer group , The Position group and the Guns group where the initial data about the enemy target comes from the observer (*as an eye to the guns far away*) to the position and then some calculations are done in the command post then the data is sent to guns . In response, shells are fired toward the target. The observer is far away from the position minimum of 10 kms , so a signals are used to send data.

So the AFO has to watch the battle field and the movements of the enemy and provide the correct information about the enemy vehicles and the actual coordinates of the targets, these information are posted to the guns to fire the shells on the targets based on the coordinates came from the AFO. And then if the shells didn't hit the target the AFO has to provide a proper displacement to the coordinates were given before.

User/Customer Description :

In reality to train one forward observer (AFO) An Artillery unit needs minimum One Battery. which means : 6 officers , 6 guns, 5 Armored vehicles , 50 shell different types , 4 rovers. lot of effort but with such a system that brings an observer to a semi-real vision of what would he see and do in the real field , the artillery corp.

We intend to save all that effort and design a simulation on computer so that the AFO can be trained on PC (while he is having his coffee). Then each unit going to train in the field has to be trained using the simulator for some time to save shells and effort.

Projects Outcomes :

Besides the benefits we have mentioned of our simulation in saving a lot of effort in training AFO we intend to study some variables that affect the Forward Observing in reality which are :

- We will study the different types of shells and we will measure the performance of our system using different shells to see how that affects the job of AFO without the need to use the real shells by only studying its characteristics like weight and the materials used in manufacturing it.
- We will study how the air conditions affect the path of the shell while it's moving ahead to its target.
- We will study different targets to see how a particular shell will affect different types of targets depending on the strength of the target.
- We will simulate the different distributions of the targets in the battle field and how that affects the job of the AFO, that distribution will be made automatically depending on real studies in artillery.

What will we do :

Using open GL in C# we will build the battle field of our simulation and periodically we will add targets to the battle field, we will add the ability to use a compass.

Then we will change the variables we have mentioned above to see their effects on the performance of our system.

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Introduction



It is only a try to do some thing out side our the university courses, a lot of students choose a traditional project and ideas from what they see in the life, but my partner Mohammad Has a different vision about the simulation project he is really smart. So we choose a different thing to study, May this is strange but we believe that engineering has a role in every field of the world.

In this project we try to simulate الميدان العسكري
We make it approximately a real war with animation place for war by visual programming
We define the operations to be happen exponentially
And the events in the war to be happen randomly

We collect a real and trust information from Jordan Army
About the objects in the war
For example Mohammad ask about the different types of

المدافع

الحشوات المستخدمة في مثل هذه العمليات العسكرية

This type of simulation is related with التدريبات و الاختبارات العسكرية

This is called الحرب الالكترونية

This is one of the most important tools used at these days with the recent wars

The most power full countries are used these tools in its war, at these days it is not face to face war

It is used a different way, different types of الأسلحة

This is controlled from out of the war

My father has experience in this area, he works at the Jordan Army for 30 years, and he told me that every thing is going in different ways than it was at the past.

As we know soldiers was enforced to the war without real vision and simulation about different agents at the war area, many agents may have role at the war results, and the soldier life has it's meaning at these days ,it is not a game it is a war,
The place where the people miss there lives.

Over View:

This simulation is called Forward Observer Operation.

As abstract view there is ضابط رصد

He is at the war (he can monitor the enemy area)

He has a role in the war:

He monitors the enemy movements and objects and record it, then he

gives the order to the battery to the Battery السرية

وهي التي تلعب دور اطلاق الصواريخ من المدفعية التابعة لها تبعا لما يتوارد اليها من معلومات من ضابط الرصد.

So there are different sources of wrong:

The information coming from ضابط الرصد

Weather agents like wind.

Error from the Battery itself

So the problem as simple as possible

There is ضابط رصد

And a Battery السرية التي تقوم بعملية الاطلاق

The enemy, there is different enemy objects

ضابط الرصد يقوم بمراقبة أهداف العدو

And every object enters his queue, and then he gives info about this object to the Battery

Then the battery tries to destroy this object.

Any object enters the queue until it is destroyed, when it is destroyed it is go out the queue, our object here is to calculate miss ratio and how to deal with it.

It is very important for the Battery to decrease the miss ratio, and increasing the hit ratio, this will decrease the number of hits.
And decrease the number of القذائف المطلقه

Objectives:

One of the most important object to this simulation is to make the war real and simplify the operation to get the ability of simulate this type of operation, so we can increase the utilization of hits.

Study the war area and different agents play rule at the war.

This gives soldiers an opportunity foe electronic training, so it makes us more confidence and self trust.

We can study the reason for miss ratio and study these reasons and its effect.

Instead of ضابط الرصد

We can use a sensors distribute it at the war area, which is collect the information about the enemy objects, movements, as we know there are different types of sensors some of them can collect temperatures information, others movements information, then send the information to a computerize battery receive and analysis the information then try to hit the object, if the battery miss it can collect these information at a data base to avoid this at next trying.

By changing the values for:

The Number of forward observer.

The Number and types of the batteries.

And expected number of the enemies that can attack us we can get the optimal number of forward observers and batteries that can face the enemy.



More Details:

This is detailed information about the program, we use:

Enemy Generation:

The enemy is generated by exponential time

The enemy type is chosen randomly

Enemy size was chosen randomly

Enemy speed was chosen randomly

Forwarded

Is a soldier who has a location in advanced place with respect to the battery, he collects the information and send it to the battery.

This soldier has different properties that we can change it:

Service time which is the time he take it to collect and precede the information and send it to the battery.

Queue: it is not a FIFO Queue, the elements enter the queue is the enemies who enter his area; this queue is rearranged with respect to the distance of the enemy, so the closest enemy has a high priority.

Error occurrence: the soldier collects the following information:

Enemy size

Enemy type

Enemy location

We add some percentage error to these variables (it can be changed); it added some reality to the simulation of this process.

Battery:

It has different properties:

Service time: the time it takes to respond to the information received by the forward observer.

This service time is depending on the type of the Battery.

These types are:

ER250

ER350

ER700

Note: these types are different in effect and range.

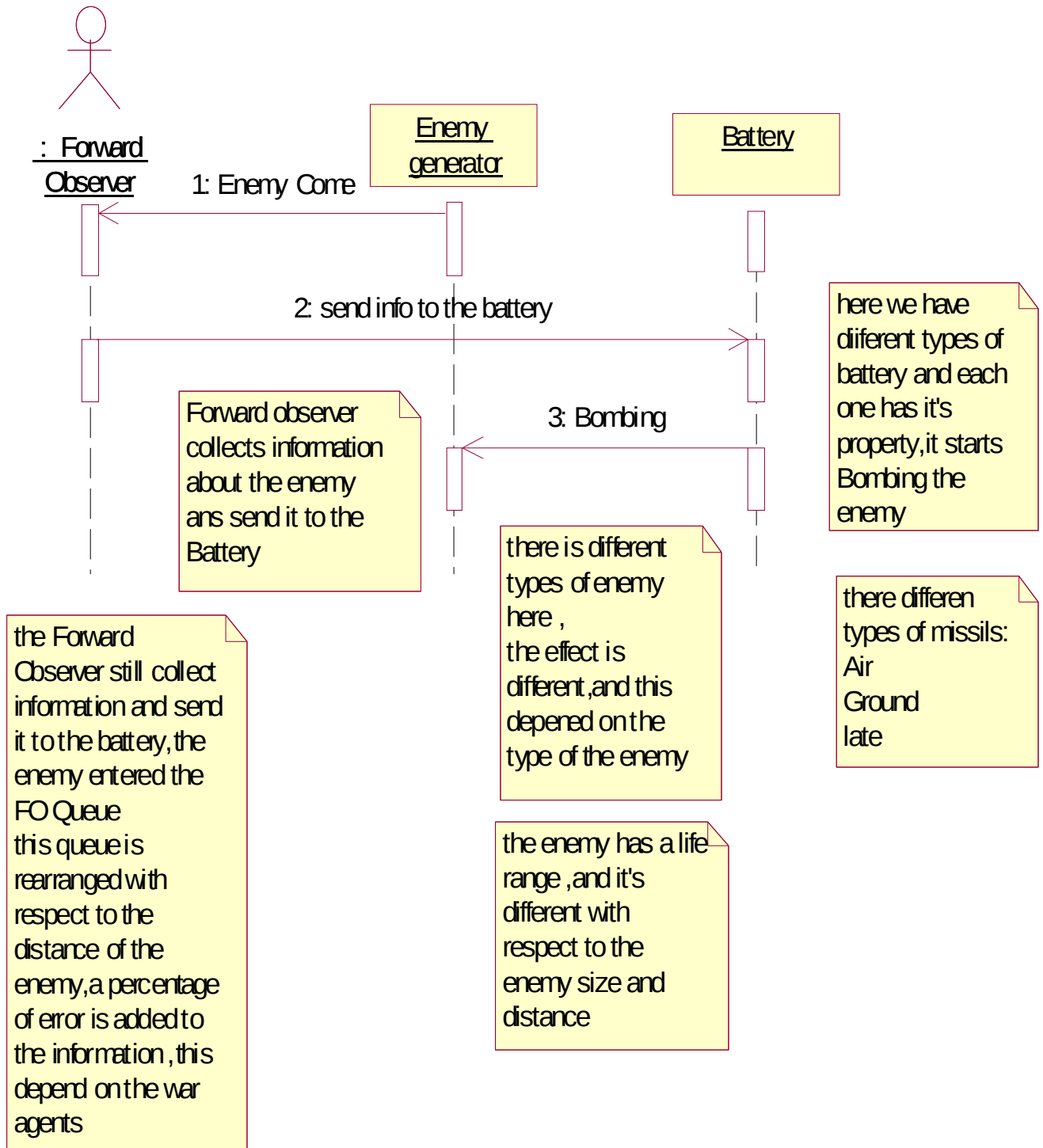
 **The effect is depending on the:**

Enemy type.

Battery type that try to destroy it.



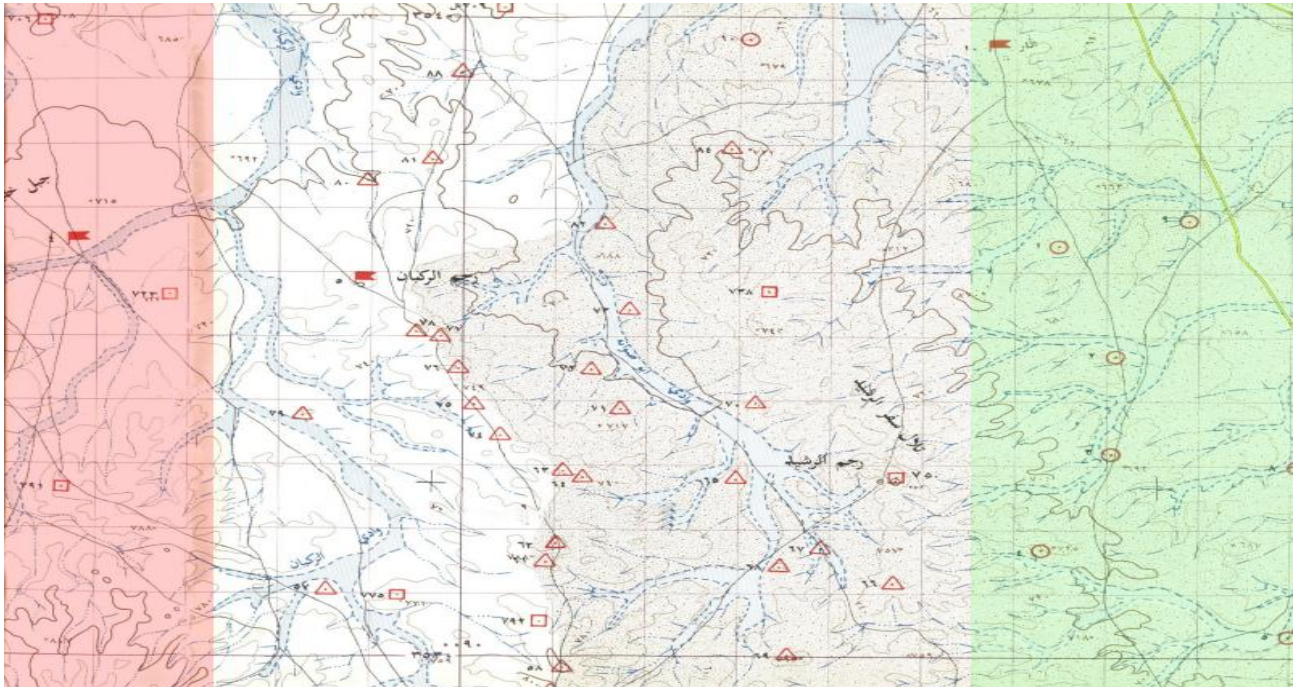
Scenario:



Example:

This example of a battle area as shown below the enemy is to the left and the forward observer is a blue square as we see, he is in the middle (we can choose the number of forward observer who collect and send the information back to the battery).

The battery is located at the right of the picture



We start generate the enemy by an exponential function, there is different types of enemies, theses types are different in size and life availability
These types are: **group=0, squad, Battery, battalion**

They start move for the right side of the battle area randomly.

An enemy enters in the Forward Observer area, so the Forward Observer start collecting information ...

And start sends this information to the battery...

It is very important to know that the Forward is a queue, and the enemy is the elements that enter the queue, the queue is not FIFO, it is re arranged depends on the change of the location for the enemy.

Let us assume that a group is move to the right of the battle area ,then the best bombs that the battery can choose to destroy it is the late(**Explode at lately it is used against soldiers in the caves**)
Or Air (Explode at the Air and it is used against Soldiers)

On the other hand let the type of the enemy is (Tanks, Small Vehicles, Defenses, Boats, Suppliers).
So the best solution to face them is (Explode at the ground and it is used against المدرعات).

In addition we have different Battery used in this battle each one of them has its properties and effective way to use, as we mention, these types are:

ER250, Service time =3 time units, Range=20

ER350, Service time =5 time units, Range=30

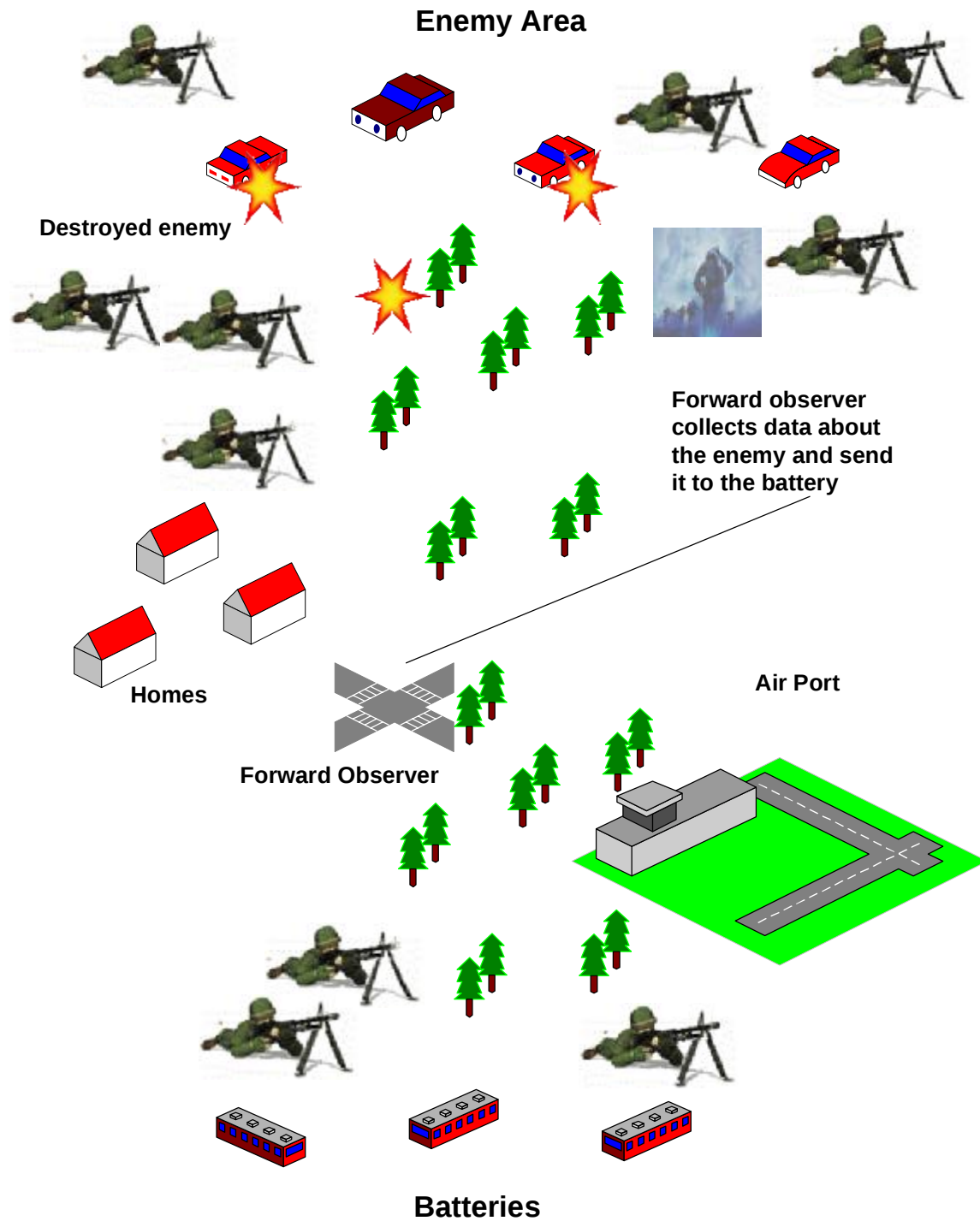
ER700, Service time =7 time units, Range=40

In addition it is very important to talk about the effect of the fuses at the enemy, it is clearly known that the Effect of the fuse is different from type to type
For example;

The effect of the ground fuse on the enemy is shown in these different numbers:

Uncovered Soldiers	50
Soldiers in Tunnel	40
Soldiers in Cave	25
Tanks	45
Small Vehicles	50
Defenses	40
Boats	30
Suppliers	60

Simple Graph using Visio Program:



Tables:

Enemy Size	
group=0	جماعة
squad	فصيل
Battery	سرية
battalion	كتيبة

Battery Type		
ER250	Service time =3 time units	Range=20
ER350	Service time =5 time units	Range=30
ER700	Service time =7 time units	Range=40

Enemy Type
Uncovered Soldiers
Soldiers in Tunnel
Soldiers in Cave
Tanks
Small Vehicles
Defenses
Boats
Suppliers

Fuse Type	
Ground	Explode at the ground and it is used against المدرعات
Air	Explode at the Air and it is used against Soldiers
Late	Explode at lately it is used against soldiers in the caves

Effect of the fuse on the enemy type:			
	Fuse		
Type of enemy	Ground	Air	Late
Uncovered Soldiers	50	60	30
Soldiers in Tunnel	40	25	60
Soldiers in Cave	25	20	60
Tanks	45	25	25
Small Vehicles	50	50	25
Defenses	40	25	60
Boats	30	50	20
Suppliers	60	40	40