

# Project in RF (ID) TAGGING & AM (AMPLITUDE MODULATION) SYSTEMS [pg 236 of SYSTEMS & SIGNALS BOOK].

11/14/05

RF ID Tag (OK) CDMA

Problem

Short Range (as of now)

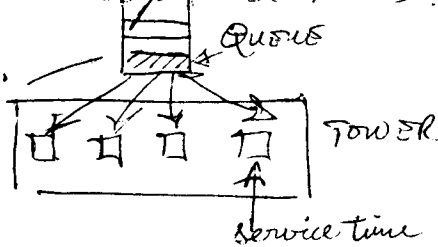
Old Bottlenecks

MAC  $\Rightarrow$  Medium Access Control  
(fail safe)

Focus

Error in transactions  $\Rightarrow$  the states' concerns  
Queueing System

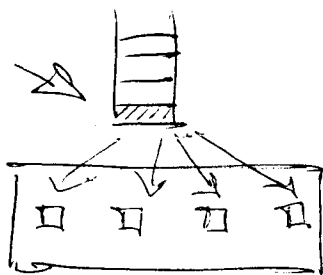
Generate a uniform random variable for the speed.  $\Rightarrow$  within 35 - 70 mph



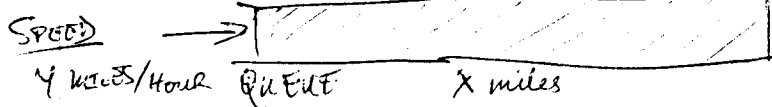
WIRELESS INFO  
Arrivals  $\Rightarrow$  poisson

Time spent  $\Rightarrow$  uniform based on speed and range

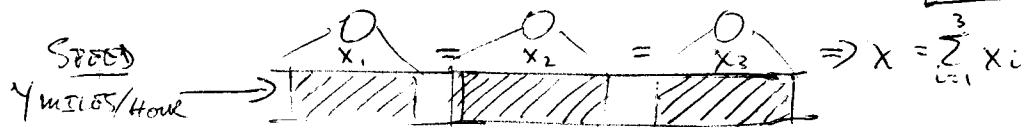
Service time  $\Rightarrow$  deterministic

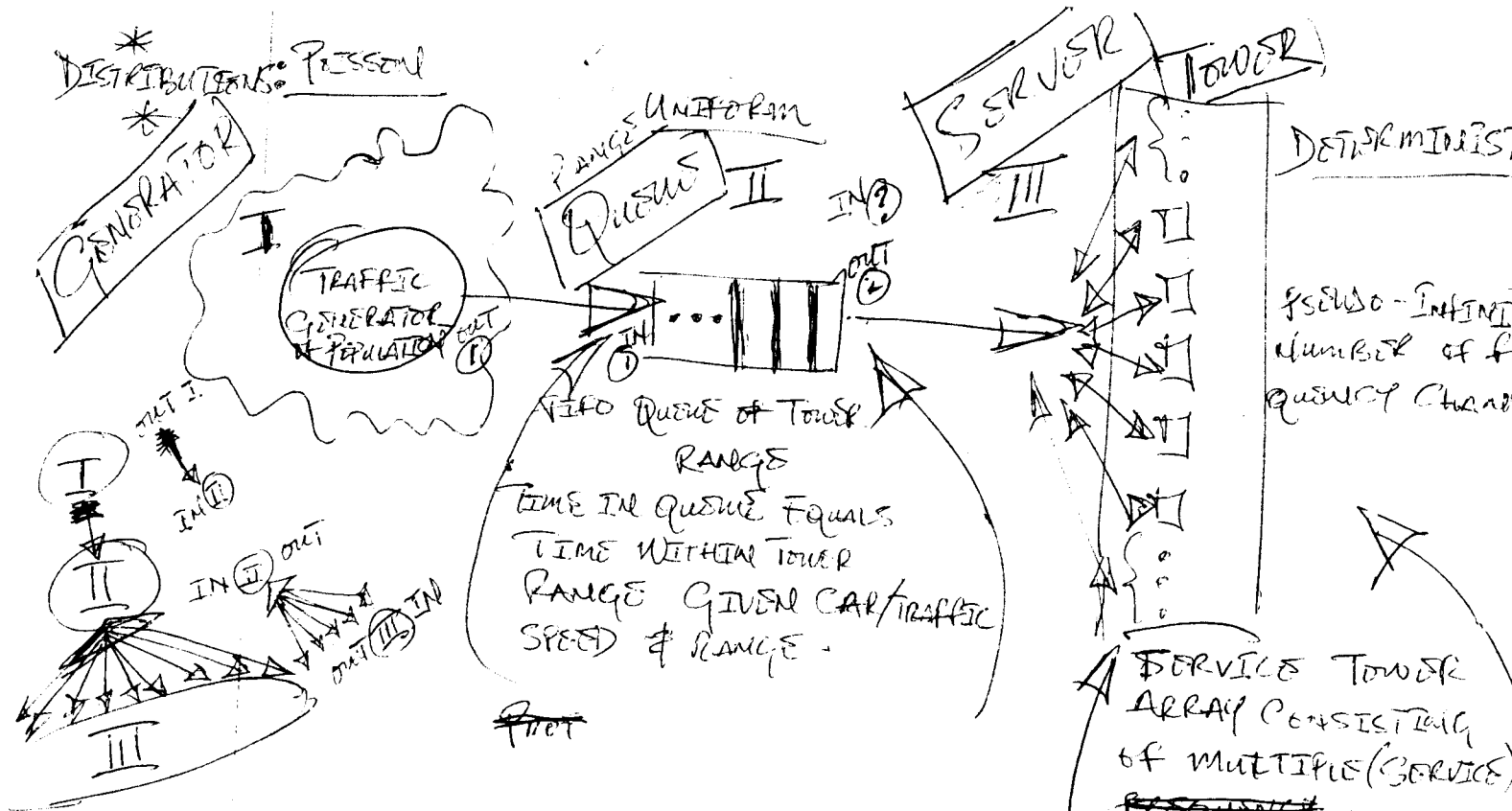


TOWER SERVICES  
(RADIO FREQUENCIES)



Cascaded Tower array may be substituted by more time spent in range and increasing the range of the towers





### GENERATOR'S PROPERTIES/PARAMETERS:

$N$  = Number of messages

$GENCAROUT$  or  $GENTRAFFICOUT$  or  $OUT$

### QUEUE'S PROPERTIES/PARAMETERS:

$N$  = ~~TRAFFIC~~ TRAFFIC SPEED (CARS PER HOUR)

$X$  = ~~TOWER~~ TOWER FREQUENCY RANGE (RANGE 5 TO 20 MILES)

$t_{range}$  = ~~TIME~~ TIME IN RANGE ( $X/N = t_{range}$ )

$g$  = Number of messages per

$AC$  = Number of error/lost messages

IN QUEUE & OUT QUEUE & IN QUEUE TOWER

### SERVER'S PROPERTIES/PARAMETERS

$m$  = Number of frequency channels ( $\rightarrow \infty$ )

$q$  = STATE OF FREQUENCY CHANNEL (BUSY/IDLE)

$t_{service}$  = FREQUENCY SERVICE TIME ( $t_{service}$  = PSEUDO-FREQUENCY MODEL & REAL SYSTEM)

SERVICE TOWER ARRAY CONSISTING OF MULTIPLE (SERVICE) FREQUENCY CHANNELS - CHANNELS WILL APPROACH INFINITY OF SERVERS, TO SIMULATE A FULLY SELF-SERVICE SYSTEM.

EACH QUEUE MESSAGE IS

UNDER THIS T

A TIMED FIFO. IF

TOWER CHANNELS ARE

BUSY MESSAGE WAIT

IN QUEUE TILL CALLED

BY SERVER. IF THE

MESSAGE IS NOT

CALLED BEFORE  $t = t_{range}$

- IN RANGE IS UP THE

MESSAGE IS DROPPED

FROM QUEUE AND COUNTED

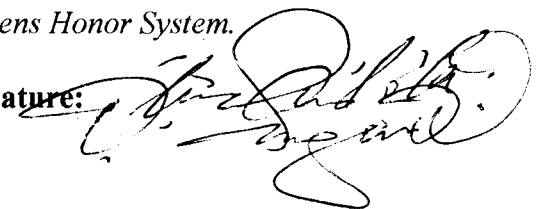
AS A LOST/ERROR MESSAGE (EQUIVALENT TO A CAR LEAVING THE RANGE OF TOLL WITHOUT PAYMENT).

**Project Proposal**  
**Wireless Relay Toll System and Simulation**  
**EE/CPE 345A-Modeling and Simulation**

**Pledge:** *I pledge my honor that I have abided by the Stevens Honor System.*

**Name:** Olurundamilola Kazeem

**Signature:**

A handwritten signature in black ink, appearing to read "Olurundamilola Kazeem", written over a circular scribble.

### **Project Proposal: Wireless Relay Toll System and Simulation**

**Case Study:** This is a study of toll systems, as present traditional systems exist—human server designs, self service change basket designs, and E-ZPass—and a proposed wireless toll system configuration for a more actualized self-service. The proposed system would be the next advancement in the current line of tolling systems. This system would ideally allow for zero interruption in traffic flow, eliminate cases of jockeying, and the concerns of queue instability in terms of arrival time exceeding service time would be remedied.

**Objectives:** The objective of the system simulation study is to orchestrate and demonstrate the feasibility and real system application. The major objective is to simulate the relaying of messages from moving automobiles to the relay system and back again, for complete toll transaction and confirmation. This proposed system configuration will rely on wireless communication technologies.

**Overall Approach and Data Gathering Schema:** To make the key and necessary inspections of both a traditional toll system and the wireless system will be modeled and simulated. The respective and corresponding distributions will be obtained for contrast and comparison. Further necessary data and information will be obtained through research of ascendant system designs of the proposed wireless system. The analyses, tools, and programs to be implemented are OMNET++, simulations tables, appropriate distributions and simulation components, and important researches of toll systems.

**Scope:** To narrow the scope of the project, ideal conditions will be assumed in complete regards the wireless communications of the system between the customers(automobiles) and the servers(the relay system as designed for self-service). This means the

investigation will not consider the Rayleigh Distribution or the Lognormal Distribution in regards to fast fading in relation to motion and slow fading as a result of environmental conditions.

Ultimately, these distributions and considerations will have to be acknowledged for a real material construction of the project. The present investigation seeks only to address the concerns of toll transaction (i.e. message relay), and the direct concerns in simulating the system within the scope.

You may want to discuss with me on how you would approach the modeling for such a project.