

USCGC Air Station Simulator



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Introduction

The United States Coast Guard (USCGC) is world's premier search and rescue, law enforcement and counter-drug organization.



Overview

- USCG needs the means to identify optimal assignment of its aircraft
- Require modeling capabilities that:
 - Analyze response and mission demand
 - Provide decision makers with alternative aircraft assignments optimized to operational and logistic capability and expected mission needs

Data



- Scheduled Missions (Mission Training)
- Scheduled Maintenance
- Unscheduled Missions (SAR, LE)
- Unscheduled Maintenance



Data



- Scheduled Missions (Mission Training)
- Scheduled Maintenance
- Unscheduled Missions (SAR, LE)
- Unscheduled Maintenance
- **Unscheduled missions and unscheduled maintenance are a little harder to model**



Background

- **Queueing theory** – the mathematical study of waiting lines or queues.
- **Queueing theory can answer questions like:**
 - Average waiting time in the queue
 - Distribution of the number of customers in line
 - Probability that the queue is empty or full

Background

- **Poisson distribution** - A statistical distribution showing the frequency probability of specific events when the average probability of a single occurrence is known.
- **Exponential distribution** - A family of continuous probability distributions. It describes the time between events in a Poisson process

Flow Chart

Helo Attributes

1. YTD hours
2. Maint. cycle hours
3. Speed
4. Range
5. Duration
6. Resuce (0/1)
7. Availability (0/1)

Random Maint. Simulator

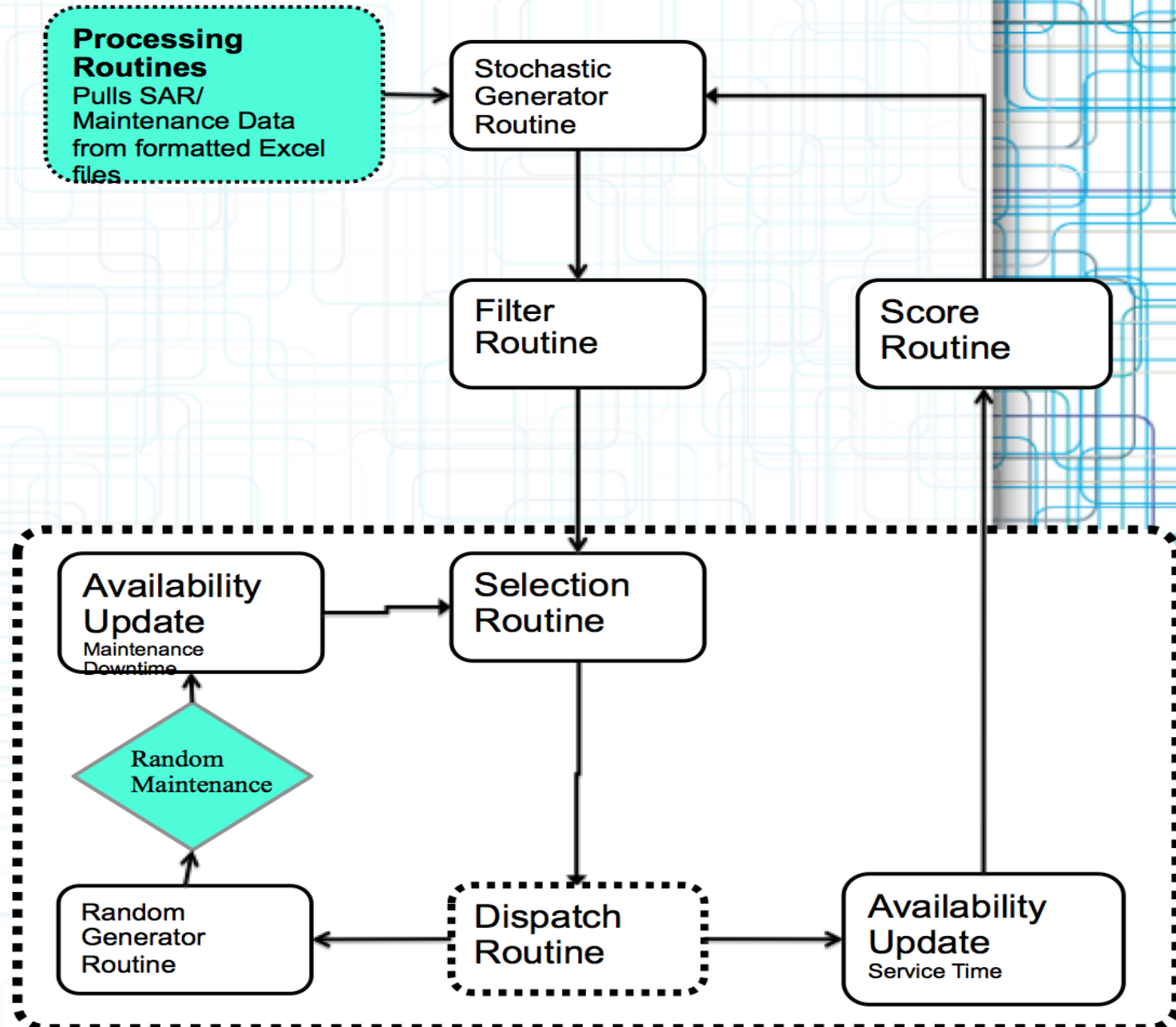
1. Downtime = fitted from data
2. State probabilities
3. Randomized digits file

SAR Attributes

1. Time of occurrence
2. Distance
3. Duration
4. Total mission time
5. Current mission: Travel time
6. Current mission: Elapsed time

Processing Routines

- Pulls SAR/ Maintenance Data from formatted Excel files



The Problem Definition

- **Currently there is a MatLab simulation, as described in the flow chart**
- **No graphical user interface**
- **Software isn't end user friendly**

My Project

- Build a Graphical User Interface (GUI) that addresses the main issue of usability
- Flexible GUI with ability to manipulate data input parameters as needed
- Output realistic statistical data such as:
 - Interarrival time of unscheduled maint.
 - Average length of service time
 - Interarrival time of SAR
 - Average length of SAR

Background

- **Human Factors**

- Understanding of interactions among humans and other elements of a system

- **Usability**

- Ease of use and learnability of a human-made object

My Project Approach

- Develop intuitive GUI while still considering
 - Human factor in computer interaction
 - Usability theory
 - Utilizing software engineering best practices

Potential Software

- **MATLAB**
 - Simulation coded in MATLAB
- **HTML5**
 - Potential choice for interface

Conclusion

Project Goal

- Overall, we are aiming to provide the USCG with a viable intuitive software package that can address their problems to assist in the maximum optimization of their unit.

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Thank You