Cretaceous Gardens Controller

Software Requirements Specification

SRS Version 1.0

Team #3
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CS 460 Software Engineering

Contents

1 Introduction

The purpose of this document is to *specify* the requirements for the development of the Cretaceous Gardens Controller (CGC). The specification is formalized and diagrammed in order to guide the eventual implementation of the system. Information encountered in the corresponding *Requirements Definition Document* is reiterated and restated here where relevant.

After this introduction [1], Section 2 gives an overview of the system. Section 3 delves into more detail with subsections 3.2 and 3.1 that feature a more granular view of the *Control Logic* and the *External Interfaces*. Section 6 provides the definition of technical terms that will be commonly used.

[1] Introduction by Ezequiel Ramos

2 General Description

This section [2] *provides a general overview of the whole system. How the system interacts with the hardware interfaces and its basic functionality are introduced here. A description of parts to be used in the system and the available functionalities for each type are also provided. Some high level constraints and assumptions for the system will be also be presented. It should be noted that a more detailed specification of constraints is covered in its own section.*

2.1 Product Perspective

2.2 Product Functions

2.3 User Features

[2] General Description by Ezequiel Ramos and Santiago Cejas

2.4 High Level Constraints

2.5 Assumptions

We assume that the infrastructure is all redundant. The CGC is installed on redundant servers. The network backbone has physical redundant links to appropriate devices like the cameras, the PA speakers, and the electric fence. We will also program redundancy into the logic. Like the ability to have another car available in case of an emergency or if the car breaks down.

Another assumption is that messages would be encrypted in order to provide the security needed, so the messages can not be intercepted and modified.

3 Specific Requirements

Section Introduction

3.1 External Interfaces

The External Interfaces[3] *make up all the pieces that the CGC communicates with. The CGC itself must communicate with everything, but a lot of interfaces can function on their own. The car interface is an example of one that needs to be able to function on it's own.*

Pay Kiosk

The Pay Kiosk interface triggers events in situations where the visitor interaction is required.

[3]External Interfaces by Anas Gauba

Incoming Events

1. Register visitor(demographics)/request money.
2. Accept money(type)/build token.

Outgoing Events

1. Activate token(id).
2. Dispense token(id).
3. Dispense change(money, receipt).
4. Log transaction.
5. Report health status to CGC.

Token

The events that the Token interface triggers are specifically related to locate the visitor.

Incoming Events

1. Trigger Alarm.
2. Return to car(carID).

Outgoing Events

1. Report location to GPS Server(gpsID).

Car

The Car interface triggers events in situations where the visitor interacts with the car as well as the internal sensors that the car is communicating with.

Incoming Events

1. Read token(tokenID)/Unlock doors or deny access.
2. Activate car()[Normal Mode]/Go to south end to pick up visitors.
3. Activate car()[Emergency Mode]/Go to north end to pick up visitors.
4. Arrived(Destination)[Normal Mode]/pick up or drop off visitors following the conditioned the protocol.
5. Arrived(Destination)[Emergency Mode]/pick up or drop off visitors following the conditioned the protocol.
6. Weight detected.
7. Change driving mode(modeName).
8. Activate intercom.

Outgoing Events

1. The GPS current location(id).
2. Alert visitors(carID).
3. Trigger alarm.
4. Report health status to CGC.

T-Rex Monitor

The T-Rex Monitor interface triggers events in situations where the actions of T Rex can be monitored appropriately.

Incoming Events

1. Inject tranquilizer.

Outgoing Events

1. Report T-Rex health.
2. Report health status to CGC.
3. Report location to GPS Server(gpsID).

Camera Network

The Camera Network interface triggers events in situations where each specific cameras operations can be easily monitored.

Incoming Events

1. Delete recording(cameraID, date range).
2. Activate recording(cameraID).
3. Monitor streaming(cameraID).

Outgoing Events

1. Camera outage(cameraID).
2. Report health status to CGC.

Electric Fence

The Electric Fence interface triggers events in the case of any possible distortion in the panels.

Incoming Events

1. Null.

Outgoing Events

1. Electricity distortion/trigger an emergency mode.
2. Report health status to CGC.

Global Alarm System

The Global Alarm System interface triggers events in situations whenever there are annoucements to be made all across the park.

Incoming Events

1. Trigger alarms[Emergency Mode]/play emergency alarm sound.
2. Trigger alarms[Normal Mode]/play Public Service Annoucement (PSA).
3. Disable alarms.

Outgoing Events

1. Report health status to CGC.

CGC Station

The CGC Station interface triggers events in situations where an employee has to respond in specific situations.

Incoming Events

1. Review health status of all the associated devices.

Outgoing Events

1. Activate tranquilizer.
2. Deactivate emergency mode.
3. Activate intercom.

GPS Server

The GPS Server interface triggers events in situations of tracking the gps devices.

Incoming Events

1. Track location(gpsID).

Outgoing Events

1. Report location(gpsID).

3.2 Control Logic

Because the CGC consists of various subsystems, it is important to understand the system within various scopes and from all subsystems' perspectives. [4]

[4] Control Logic by Siri Khalsa, Anas Gauba and Santiago Cejas

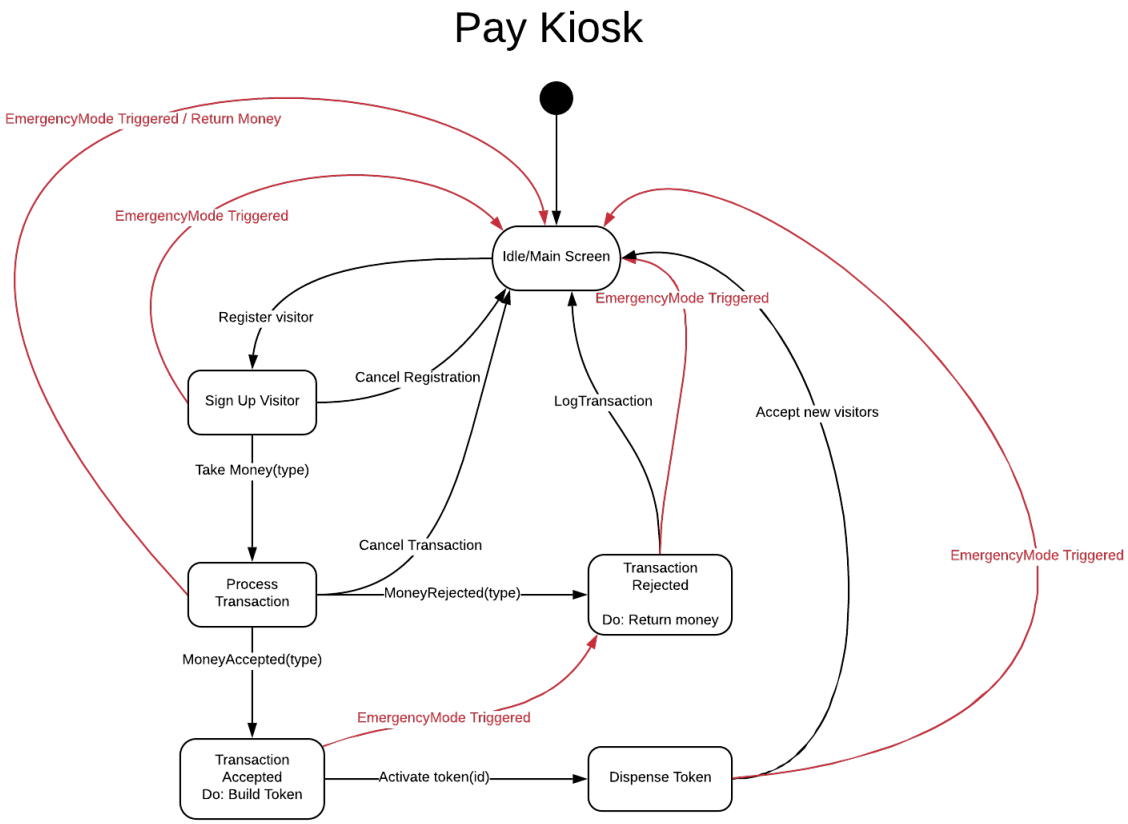

Figure 1: Pay Kiosk Dynamic Control Model

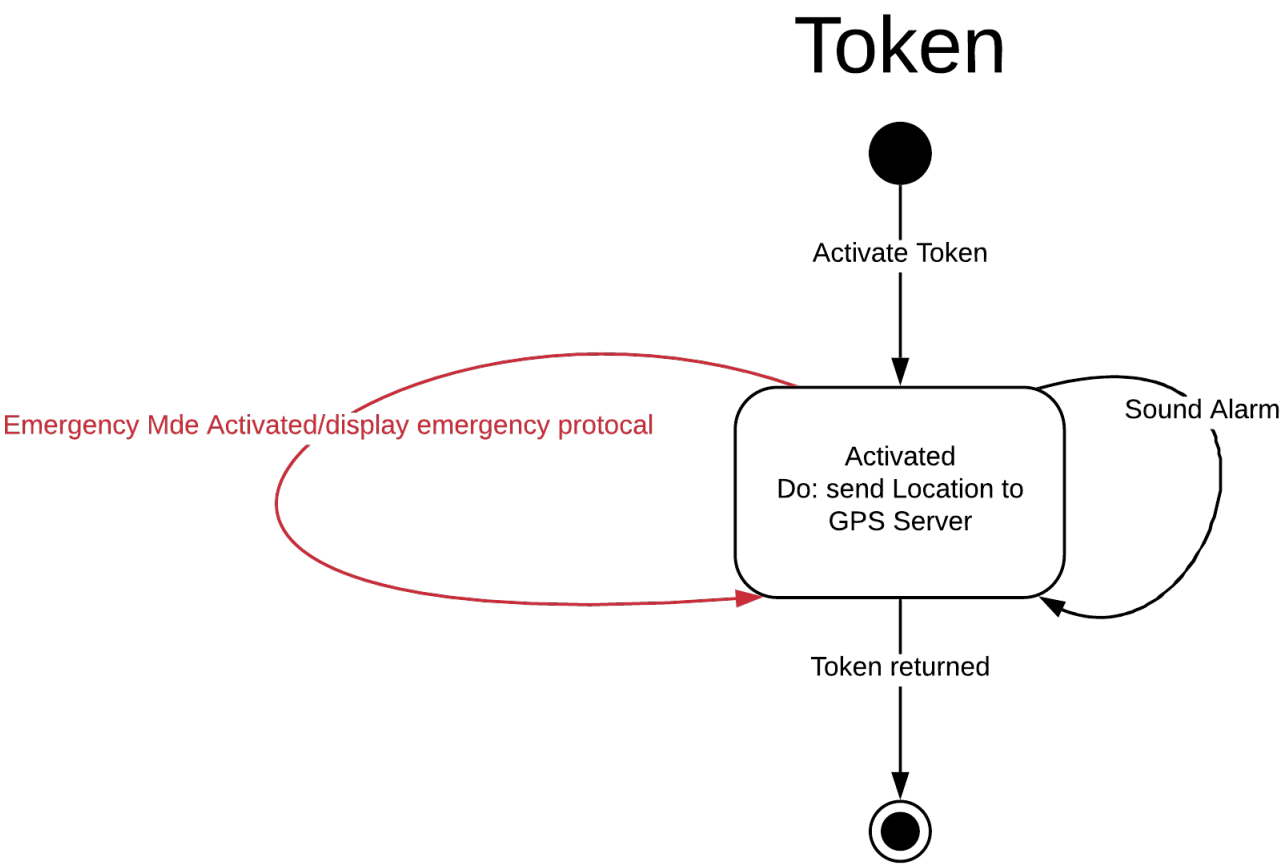

Figure 2: Token Dynamic Control Model

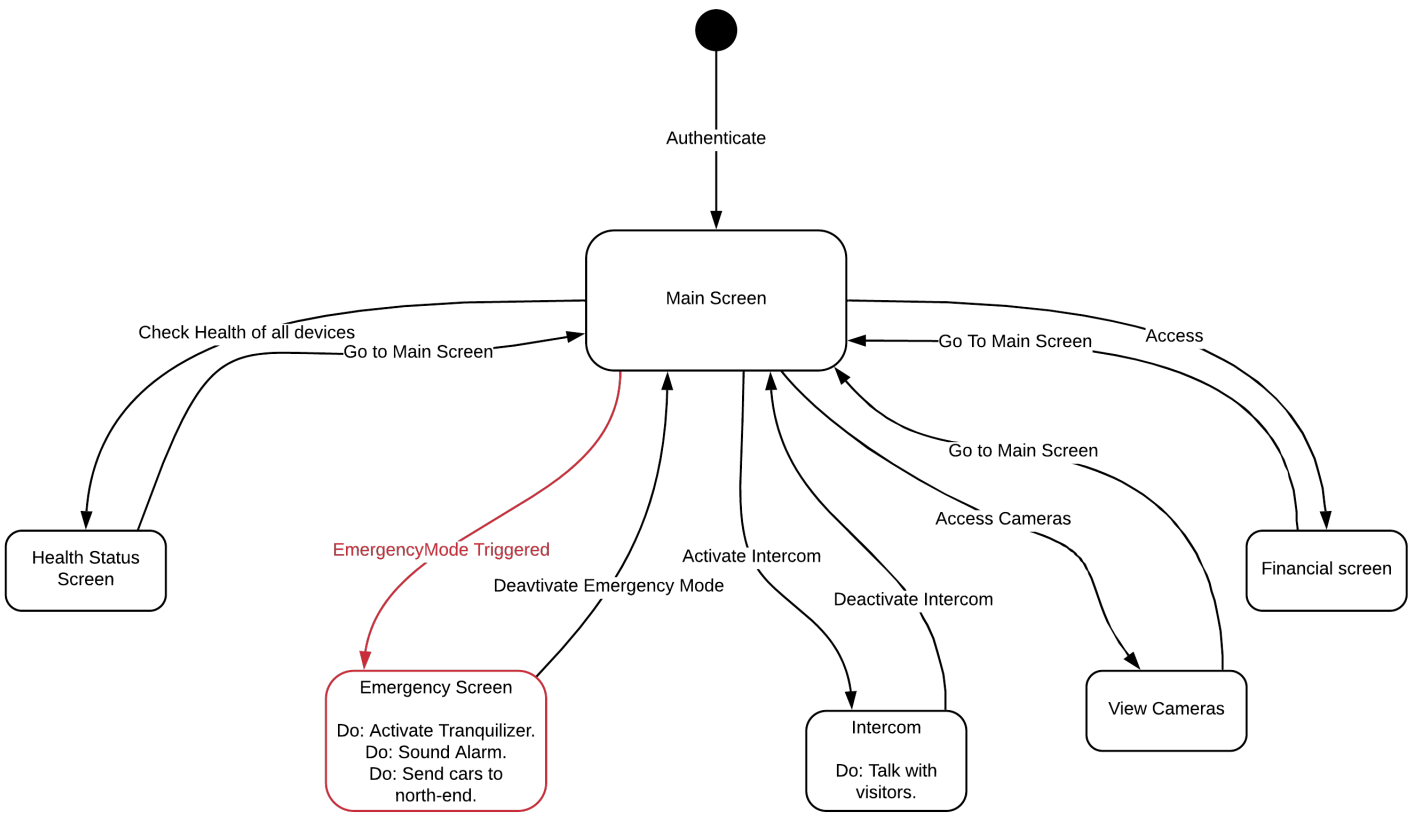

Figure 3: CGC Station Dynamic Control Model

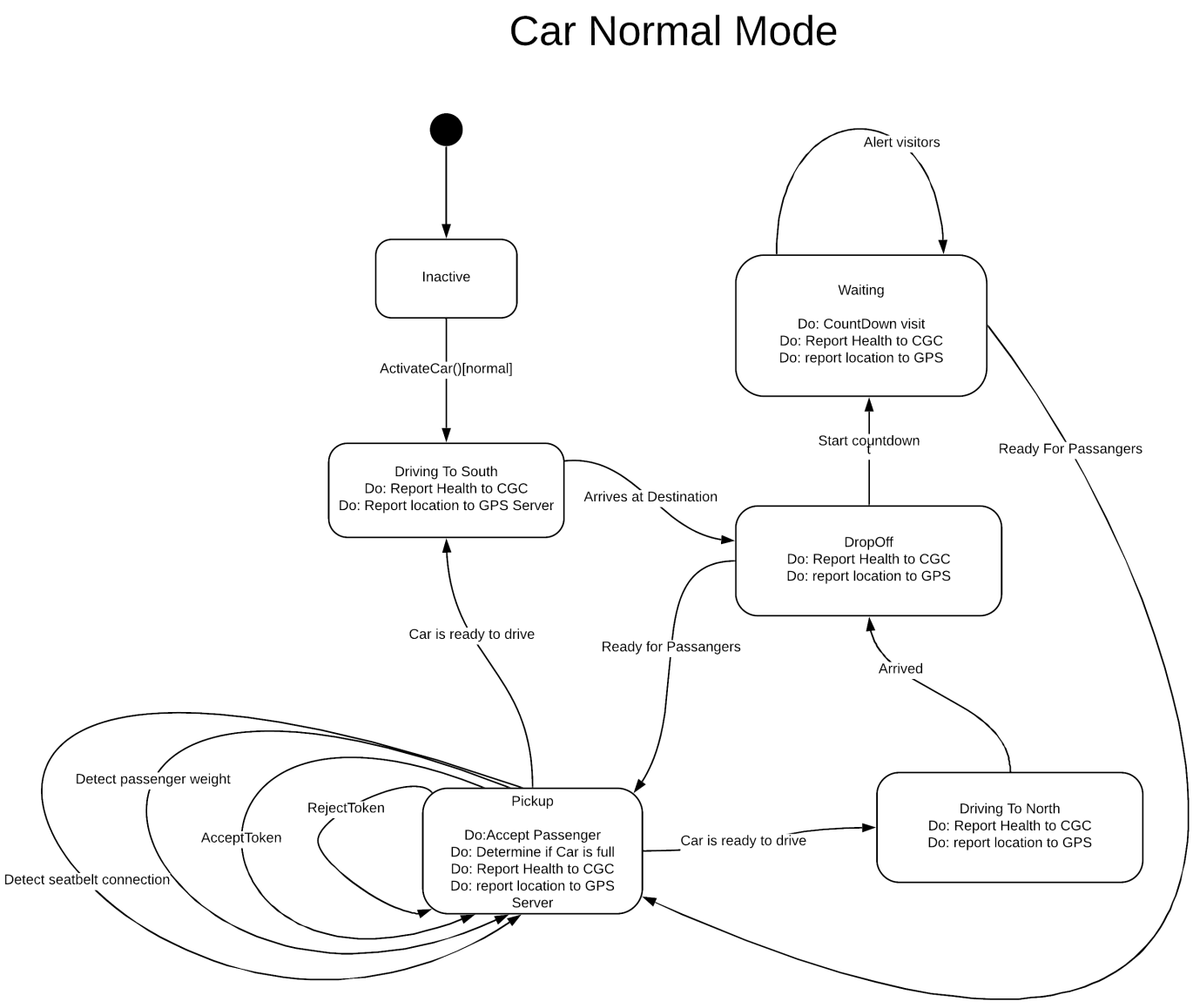

Figure 4: Car Normal Mode Dynamic Control Model

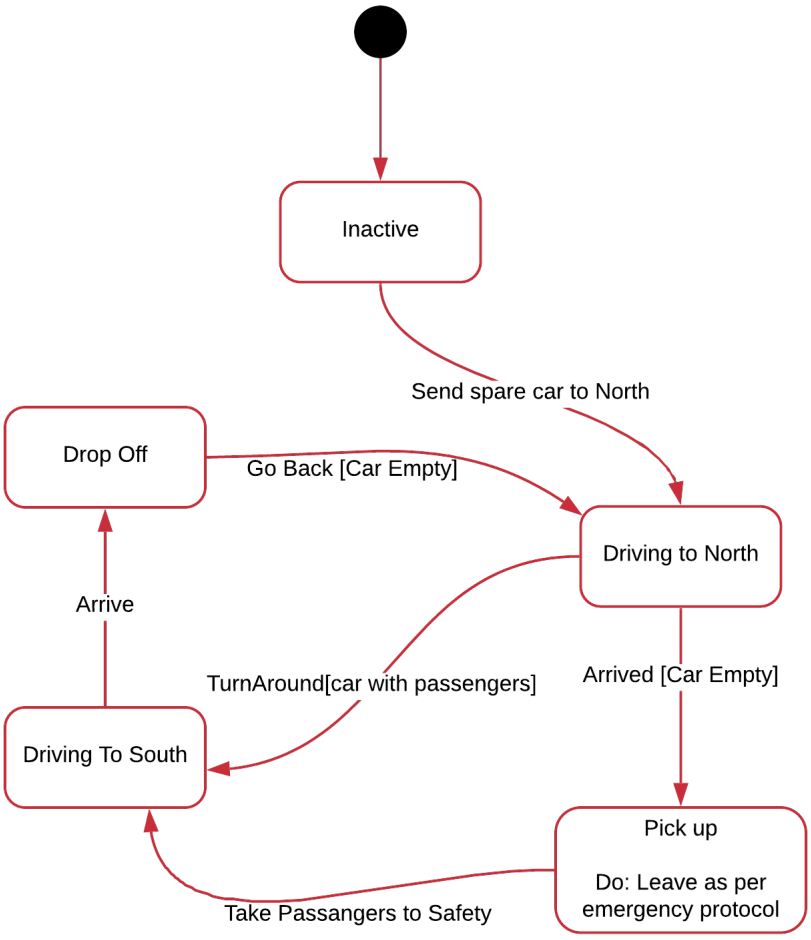

Figure 5: Car Emergency Mode Dynamic Control Model

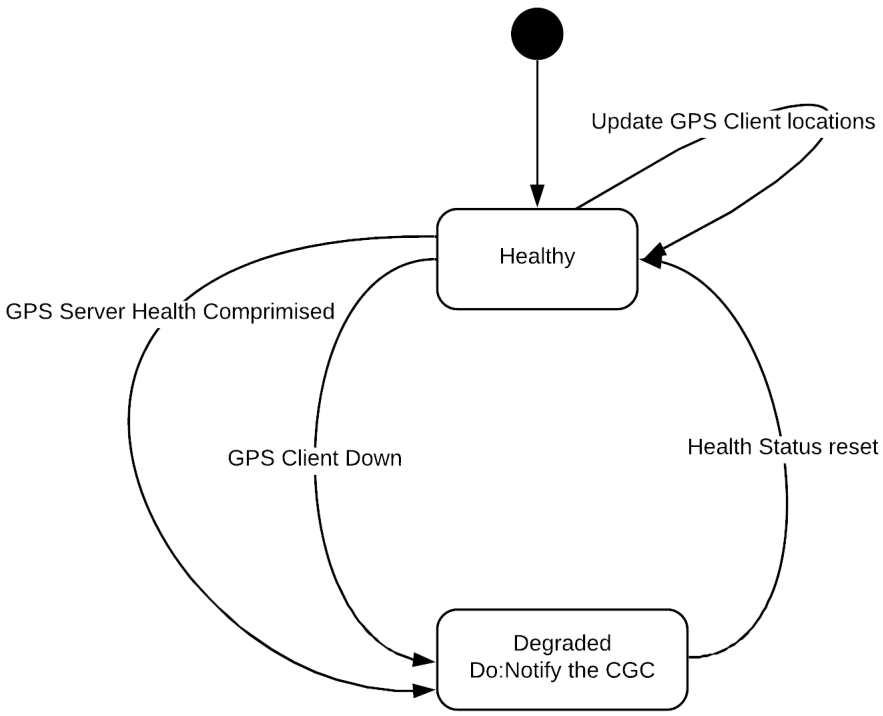

Figure 6: GPS Server Dynamic Control Model

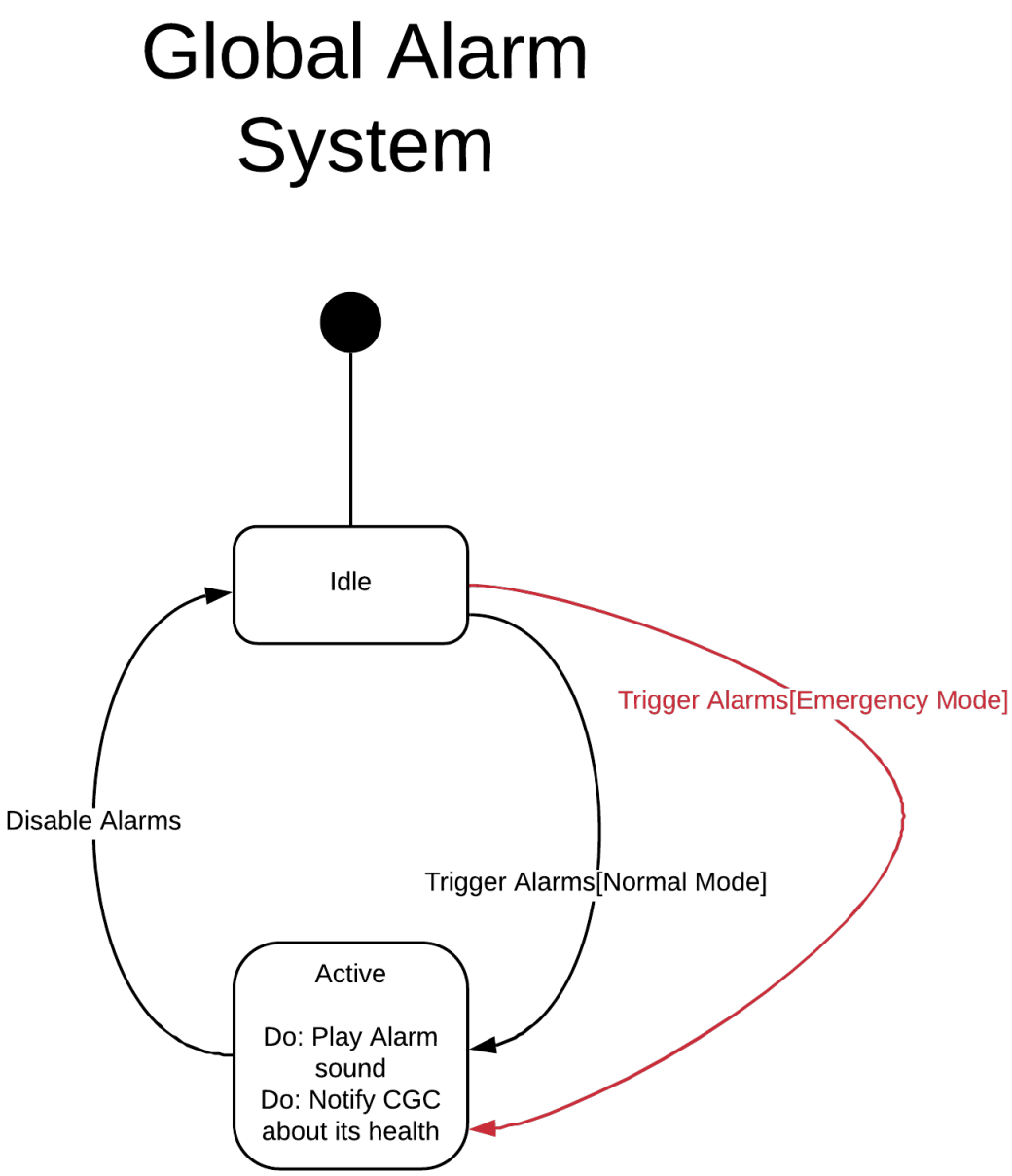

Figure 7: Global Alarm System Dynamic Control Model

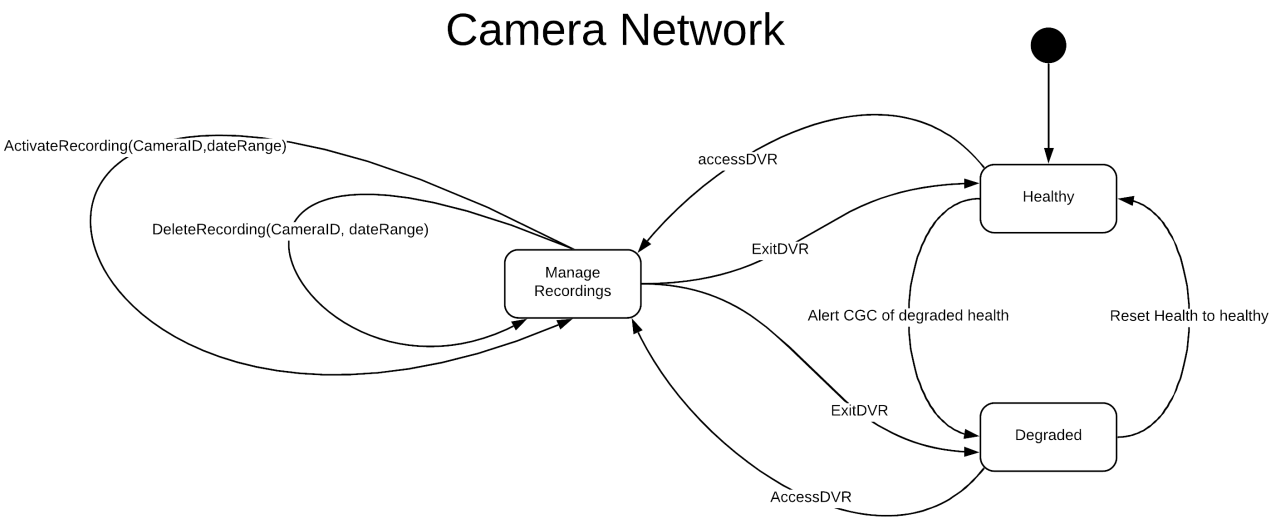

Figure 8: Camera Network System Dynamic Control Model

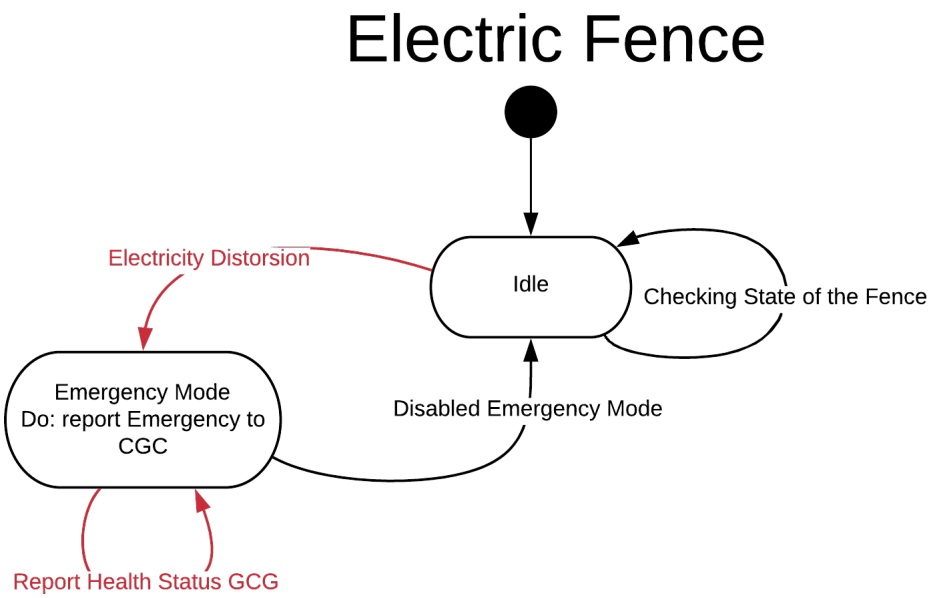

Figure 9: Electric Fence Dynamic Control Model

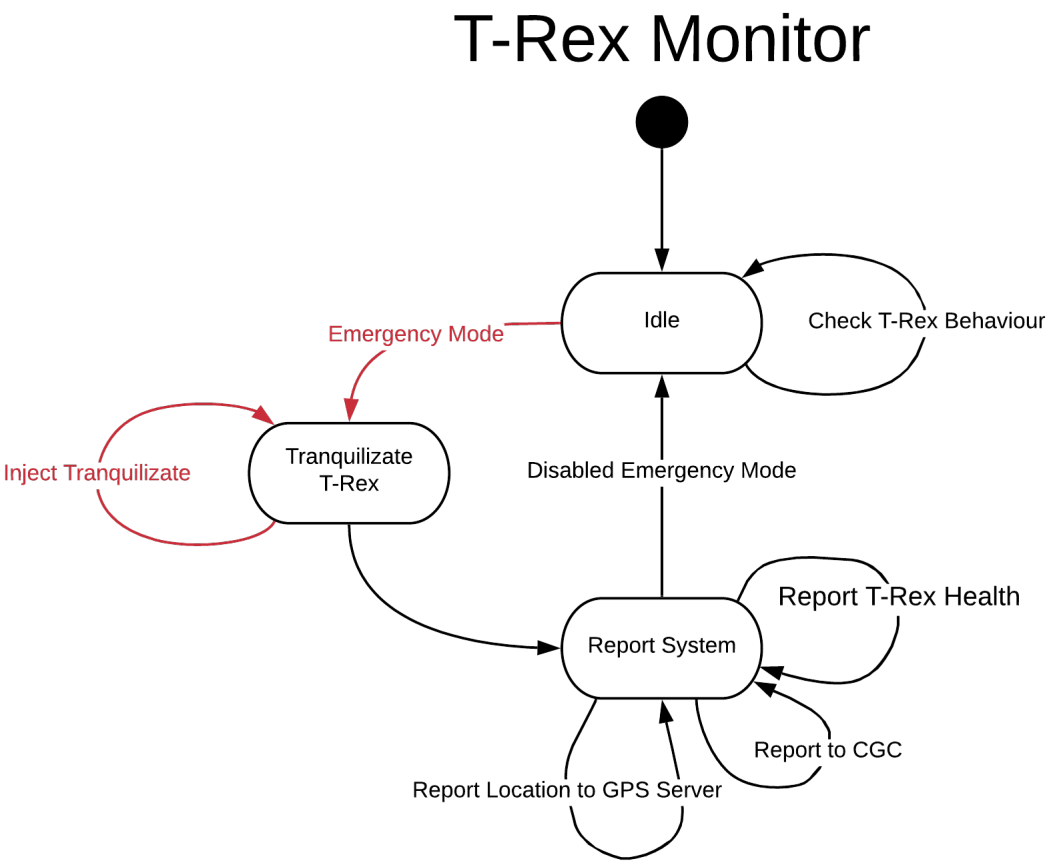

Figure 10: T-Rex Monitor Dynamic Control Model

4 Design Constraints

There are quite a bit of constraints[5] *that the CGC must address in order to successfully function.*

4.1 Client

- The visitors must arrive and purchase tokens from the pay kiosks on the south-end of the island.

[5]Design Constraints by Anas Gauba

- The visitors must get a token which acts as a GPS device as well as RFID key to easily access the perks.
- There must only be one token per visitor.

4.2 Safety

- There must be an emergency mode in the event of the enclosure failure.
- The vehicles must alert and instruct visitors in the event of an emergency.
- The alarm system must be audible on both the north and south ends.
- The vehicles must facilitate evacuation in the event of an emergency.
- There must be a surplus of vehicles on either end of the island at all times.
- The tokens must provide additional evacuation information such as visitor's location.
- The cars must maintain safe speeds at all times.
- The cars must lock the doors before moving to its destination.

4.3 Regulations

- The vehicles should accomodate up to ten visitors (excluding the emegency scenario).
- The vehicles must alert visitors once their alotted time is up.

4.4 Security

- The T-Rex location is critical and it must be known at all times.
- The camera network stream must be available around the island at all times.
- The employee must directly monitor the health of all the devices, especially the ones which can cause harm to the visitors, such as, T-Rex and Electric Fence.

5 Sample Use Cases

intro saying categorized by actor with diagrams blah blah blah these uses are just samples

5.1 CGC System Technician

The this actor (CST) specializes in addressing hardware issues with the CGC Station. This individual is responsible for repairing disk drives, monitors, redundancy elements within the station, etc.

Use Case: UpgradeSystemMemory

Primary Actor: CGC System Technician

Goal in Context: To upgrade the memory of the machines within at CGC Control Station (e.g. add 16 GB RAM).

Preconditions: The CGC is not in emergency mode but may be in either maintenance or normal mode.

Trigger: Cretaceous Gardens experiences an increase in demand, which (if the trend continues) will require more computational resources to handle more guests, more efficiently.

Scenario:

1. The Sales Department notices a distinct upward trend in sales.
2. The findings percolate through the relevant business entities within the company.
3. The CST is dispatched to the Control Station.
4. The CST enables maintenance mode.
5. The CST upgrades machines that are currently being used for redundancy.
6. The CST enables maintenance mode on the redundant machines.
7. The redundant machines and active machines, switch roles.
8. The CST upgrades the now-redundant machines.

9. The CST performs tests.
10. The CST disables maintenance mode in both active, and redundant machines.

Exceptions:

The trend is ignored by management.

Priority: Moderate, should be implemented.

When Available: On demand.

Frequency of Use: Every two or three fiscal years.

Channel to Primary Actor: Control station hardware.

Secondary Actors: Sales Department, CGC Control Station, Pay Kiosk

Channels to Secondary Actors:

Sales Department: pay kiosk transaction logs

CGC Control Station: direct access

Pay Kiosk: direct connection

Open Issues:

None known.

5.2 Tyrannosaurus Rex

It may be argued that this is not a legitimate actor, but despite its unconscious interaction with the system, the T.Rex can act on the system in a variety of - possibly unpredictable - ways.

Use Case: LeaveEnclosure

Primary Actor: T.Rex

Goal in Context: To get somewhere that happens to be outside the enclosure.

Preconditions: Actor is not sedated, the system is not in maintenance mode nor emergency mode, and all components are functioning properly.

Trigger: The T.Rex sees or smells something outside the enclosure.

Scenario:

1. The actor looks through the enclosure, toward an imagined near-future destination beyond the enclosure.
2. The actor walks toward the target destination.
3. The actor is impeded by the electric fence.
4. The actor becomes fearful.
   (a) The actor retreats from the fence.
   OR
   (b) The actor attacks the fence.
5. The electric fence increases its voltage.
6. The scenario may repeat from either act 1, from act 3, or continues such that:
   (a) the actor is sedated to prevent further damage to self or enclosure, and maintenance mode is triggered
   OR
   (b) the enclosure is breached, the actor heads toward the target destination, and emergency mode is triggered.
   OR
   (c) the actor relinquishes the desire to head toward the target destination, no significant damage is incurred, and the normal mode of operation continues.

Exceptions:

Actor Perishes.

Priority: Essential, must be implemented.

When Available: At random.

Frequency of Use: Preferably never, but less likely with time (ideally)

Channels to Primary Actor:

Electric Enclosure Panel

T.Rex Monitor

Secondary Actors: CGC Station Operator, Global Alarm System

Channels to Secondary Actors:

CGC Station Operator: Camera Network, T.Rex Monitor

Global Alarm System: Electric Enclosure Panel

Open Issues:

None known.

5.3 Veterinarian

The veterinarian role includes uses such as routine checkups or medical treatment for the T.Rex.

Use Case: RoutineCheckup

Primary Actor: Veterinarian

Goal in Context: To perform a regular physical exam on the T.Rex.

Preconditions: The T.Rex has been successfully sedated, the veterinarian is completely prepared, the CGC is not in emergency mode, and all components are functioning properly.

Trigger: The time for a physical has arrived.

Scenario:

1. The CGC Station Operator dispatches the veterinarian in a self driving car to the edge of the enclosure closest to the current location of the T.Rex.

2. The veterinarian requests an all-clear confirmation from the operator.
3. The CGC Station Operator confirms sedated state of the T.Rex.
4. The operator disengages the electricity of the panel to provide access.
5. The veterinarian enters and travels toward the animal.
6. The operator starts a timer.
7. The veterinarian arrives at the location of the animal.
8. The operator stops the timer.
9. The veterinarian performs a physical exam while the operator provided updates on the sedative state of the T.Rex.
10. The operator alerts the veterinarian when the previously recorded elapsed time is approaching the approximated amount of time until the T.Rex wakes up.
11. The veterinarian concludes the exam.
12. The veterinarian replenishes the sedative reservoir in the T.Rex Monitor.
13. The veterinarian travels toward the point of entry.
14. The veterinarian exits the enclosure.
15. The Operator confirms successful exit.
16. The Operator reengages the electricity of the panel.

Exceptions:

The T.Rex is found to be in poor health.

The sedative lasts less time than expected.

Priority: Essential, must be implemented.

When Available: On Demand.

Frequency of Use: As little as once a year.

Channel to Primary Actor:

Enclosure Panel, T.Rex Monitor

Secondary Actors: CGC Station Operator, T.Rex, Car

Channels to Secondary Actors:

CGC Station Operator: Car Intercom, Camera Network

T.Rex: Enclosure Panel, T.Rex Monitor

Open Issues:

Should the panel remain inactive while the veterinarian is inside?

Should the veterinarian simply wear an electric safety suit to avoid disengagement all together?

5.4 Zookeeper

A zookeeper may interact with the CGC in a variety of ways, but some of the major roles of such an actor (as with any zookeeper) are to prepare the diet of the T-Rex, feed the T.Rex, to observe its behavior, or groom it.

Use Case: FeedTRex

Primary Actor: Zookeeper

Goal in Context: To safely provide food for the T.Rex, whether it be live, frozen, thawed, or prepared prey.

Preconditions: The CGC is not in emergency mode, and all components are fully functional.

Trigger: It is time to feed the T.Rex.

Scenario:

1. The CGC Station Operator dispatches the zookeeper in a self driving car to the edge of the enclosure furthest from the current location of the T.Rex.
2. The Zookeeper requests an all-clear confirmation from the operator.

3. The operator disengages the electricity of the panel to provide access.
4. The Zookeeper enters and travels a significant distance into the enclosure.
5. The Zookeeper drops off the food.
6. The Zookeeper travels back the point of entry.
7. The Zookeeper exits the enclosure.
8. The Operator confirms successful exit.
9. The Operator reengages the electricity of the panel.

Exceptions:

There is a shortage of food on the island.

The T.Rex is sick or injured and does not want to eat.

The T.Rex reaches the zookeeper before the zookeeper exits the enclosure.

Priority: Essential, must be implemented

When Available: On demand and via operator-zookeeper protocol

Frequency of Use: Periodically (it can be daily, weekly, or monthly for example)

Channel to Primary Actor:

Enclosure Panel

Secondary Actors: CGC Station Operator, T.Rex, Car

Channels to Secondary Actors:

CGC Station Operator: Car Intercom, Camera Network

T.Rex: Enclosure Panel

Open Issues:

Should the panel remain inactive while the zookeeper is inside?

Should the zookeeper simply wear an electric safety suit to avoid disengagement all together?

6 Definition of Terms

The following is a list of definitions [6] *of the most commonly used technical terms within this document, whose meaning may not be immediately apparent to the lay reader. Most definitions come from no specific source; instead they are defined by the authors in the context of their use in this document and originate from the vocabulary shared across the general references cited . In the event that a definition was taken directly from a source, it is followed by a citation*

CGC: Acronym for Cretaceous Gardens Controller

DVR: Acronym for Digital Video Recorder

Electrical Conduction: The movement of electrically charged particles through a transmission medium.

GPS: Global Positioning System

Hardwired Ethernet: This references the latest IEEE standard for Ethernet utilizing physical cables.

Network: All nodes with which the CGC interacts, the links that connect them to each other and to the CGC, the CGC itself, and all related databases.

Node: The generic term that refers to any device connected to the CGC in any way. This includes autonomous vehicles, tokens, the T.Rex monitor, all electric fence panels, all kiosks, and all cameras.

Safely Inactive: A state in which a vehicle is fully functional and ready to be dispatched.

Safely Occupied: A state in which a vehicle contains at least one person, is locked, and is ready to depart.

Token: An interactive device used by the visitor that grants access to locations.

[6] Definition of Terms by Anas Gauba