Cretaceous Gardens Controller

Technical Feasibility Study

TFS Version 1.0

Team #3
15 October 2019

CS 460 Software Engineering

Contents

1   Introduction

With new technological advancements come new opportunities and new risks. It is important for any entrepreneur to be able to conservatively calculate potential benefits, and to liberally estimate potential liabilities. With that in mind, Cretaceous Gardens (CG) ought to expect a system that delivers efficient service while minimizing the accumulation of loss and liability. It is understood that CG has in its hands the torch of bioengineering achievement, therefore the feasibility of a controller (CGC) necessarily impacts the position of CG at the top of the field. No great feat comes without risk, therefore an ideal controller shall prioritize the safety of visitors to the island. Only after such a guarantee can be established, should the system then prioritize efficiency and profitability. Without an impeccably safe system, a long-term influx of customers is unlikely and without that, there are simply no worthwhile profits to be collected .

The island is understood to be overlaid with a vast network of agents and equipment to ensure the reliable connectedness of the resort. All nodes (whether it be the autonomous vehicles that are to transport precious visitors to and from the main attraction, the electric fence enclosure that will house the mighty *Tyrannosaurus Rex*, the system of security cameras, the reliable maintenance crew, or the kiosks that are to dispense every single accounted-for token) will ultimately be under the wings of the ideal controller. Considerations should be made early with regard to broad organization of the system (i.e. centralized, with plenty of redundancy or a distributed in order to avoid a single point of failure?). Below is an outline of such considerations, some given by Cretaceous Gardens, and many others provided by the developers of the system.

2   Logistic Implications

section introduction

2.1   Given Constraints

Constraints provided by CG are presented as a foundation on which to build. It should be noted that it is not necessarily complete, as more may be

provided in the near future. It is as likely that some may be deemed unnecessary if another constraint is found to subsume them. Questions pertaining to a given constraint are shown parenthetically.

- Visitors will arrive by port on the *south side* of the island.
  (At what rate?)

- The main attraction will be located on the north side of the island.
  (Are there multiple routes?)

- The main attraction will be a *Tyrannosaurus Rex* within a massive electric fence enclosure.
  (Can it be monitored on a per-panel basis?)

- An automatic payment kiosk will provide a unique token *or* ticket to each visitor.
  (What if the item is damaged or lost?)

- The token *or* ticket will grant vehicle access *and* exhibit viewing access.

- Self-driving car(s) are to stop at the *south end* in order to drive *at most* 10 people.
  (How many cars at a time?)

- All cars are to lock securely *before* transporting visitors to the north-end.

- All cars are to unlock *after* arriving at the exhibit.

- All cars are to alert visitors when their allotted time to be at the exhibit has run out.
  (Will this alert be different than an emergency alert?)
  (What should happen if a visitor ignores the "time-up" alert?)
  (Who or what will enforce this?)

- The vehicle is not to leave until all visitors are inside the vehicle.
  (Even during an emergency?)

- The positions of all cars are to be accounted for at all times.
  (To what precision?)

- There will be *at least* one video camera.
  (Will it be closed circuit?)
  (What kind of camera?)

- Doors are to lock securely with all guests inside **before** returning the *south end*.

- There is to be a *very strict* protocol in the event of an enclosure failure.

- The emergency alarm is to sound at both ends of the island.

- The system is to be responsible for the quick transport of all visitors to the south end in the event of such an emergency.
  (What should be done if casualties occur?)
  (Should an optional manual driving mode be made available to willing visitors in such an emergency?)
  (What should happen in the event of path obstructions?)
  (How resilient will the vehicles be in the local terrain?)

2.2   Additional Constraints

subsection introduction

General

All nodes within the network must also be manually accessible.

The CGC can only return to *normal* mode (from *emergency* mode) via human intervention.

If names, emergency contacts, and waiver information is collected, the CGC must have access to it.

Any backup power sources must also be available to the CGC.

Surveillance

All camera feeds must be accessible through the CGC.

All components must be *hot-swappable*.

All uplinks must feature sufficient redundancy.

Payment

All tickets *or* tokens must be unique.

Credit, debit or cash must be accepted at every kiosk.

The CGC must have access to the status of every kiosk.

All kiosks must have a *normal* mode and *maintenance* mode of operation.

Cars

The total number of active *and* inactive cars must be known at all times.

Must have a *normal* mode and an *emergency* mode of operation.

Must make use of a Global Positioning System (GPS).

Must feature a loud speaker.

All cars must have unique identifiers.

All cars must feature an RFID reader.

All cars must feature an intercom system to communicate with staff.

All cars must maintain a record of their current passengers.

Some fraction of all cars will always patrol the island.

Some fraction of all cars will serve as surplus on either end of the island in case of emergency.

All cars may ignore passenger assignments so as to accept any passengers during an emergency.

All available cars are to be dispatched to the north end during an emergency.

There must be a protocol to handle the breaking down of any vehicle in use.

Enclosure

Emergency mode must be activated upon failure.

There must be a maintenance mode or status for the enclosure.

The status of every enclosure panel must be available to the CGC.

Alarms

The alarm must be audible *everywhere* on the island.

The alarm sound must be distinct from any other sounds.

3 Findings

section introduction

3.1 General

The general findings for this system are somewhat straight-forward. In order to be feasible, this system needs a working camera network. This Cretaceous Gardens Controller (CGC) will manage all the cameras. There will also be self paying kiosk which will present tokens/tickets that are unique to each customer. These unique ID will act as a key and a locator(GPS) for each user. The kiosk's main functionality will be to give tickets to the user, accept credit/debit card or cash as the payment option from the user. In addition to that, it is also feasible that the user should fill out the form with their names, emergency contact and a waiver so that the CGC can easily manage people's records.

When we talk about each user getting an ID, another benefit of getting an ID is that the customers unlock the perk of having a self-driving car at their disposal. It is important to note here that the self-driving cars are contracted out. There are several features which a basic self-driving car has these days. These main features include: having a GPS device so that it can transfer customers from one place to another, have basic speakers and door sensors for customer's safety, and have an access to camera so that it can drive autonomously. In addition to that, to make it feasible to this project,

the self-driving car must have a unique car ID for the CGC to easily locate. The self-driving car must have a RFID reader so that it can let the customers in the car. The self-driving car must be able to switch modes such as normal mode and emergency mode. The self-driving car must have a call button to talk with the *Control Station*.

3.2   Safety

subsection introduction

body paragraph

3.3   Emergency

subsection introduction

body paragraph

3.4   Maintenance

The maintainability of this system is extremely important. It is critical that every device that communicates through the system are maintained and in peak performance at all times. Well maintained equipment will fail less. Due to the intense need for safety we can not cut corners for the CGC and need for a system that identifies the need for maintenance efficiently is critical. This project can be technically feasible. The maintenance system will monitor and respond to all cars, the electric fence, the camera network, the kiosks and tokens.

body paragraph

3.5   Cars

The autonomous vehicle is a unique piece of equipment. It is fully aware of the sensors and parts that it controls. We will leave it up to the company that we contract out to build cars that can identify when they need maintenance. We will work with the vehicle manufacturers to make sure the cars follow

specific maintenance protocols. We will build protocols that address how a car behaves if it needs maintenance while with passengers out on the island but can still drive, or if it is more serious and the car can not drive.

body paragraph

4   Conclusions

section introduction

body paragraph

body paragraph

References

[] Eliot, D. L. (2018).

[] Harris, R. (2018).

[] IEEE.

[] IEEE.

[] IEEE (2013).

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2.

[] Last, F., Last1, F., and Last2 (2012).

[] NVIDIA.

[] Reiner, A., Boll, S., and L. Kun, A. Automotive user interfaces in teh age of automation. Technical report, University of Applied Sciences Ingolstadt, University of Oldenburg, University of New Hampshire.