\section{Introduction}

\subsection{Overview}

Stadium Traffic aims to reduce the greenhouse gas (GHG) emissions from people going to and from sports games. In particular, our project focuses on the Citizens Bank Park where fans of the Philadelphia Phillies support their team at home games. We have built a model that can be used to quantify the GHG emissions generated due to people coming to and going from games using cars as well as public transportation. We have created a front-end website that fans can use to understand the environmental impact of their mode-choice in traveling to and from home games. Our project is endorsed by the Philadelphia Phillies. They have recognized our efforts toward reducing GHG emissions due to fans traveling to and from these home games and reducing congestion in the parking lots at the stadium by encouraging fans to switch to SEPTA.

\subsection{Motivation}

All of us have been to large gatherings like sports games, concerts or conferences and can therefore relate to the traffic problems when everyone is trying to leave at the same time at the end of the event. However, what most people don’t realize is the environmental effect of this traffic. Our project aims to find solutions to reduce this traffic and hence reduce the emissions while cars idle in parking lots trying to leave.

The project is focusing on the Philadelphia Phillies stadium, but the underlying models adaptable to other venues hosting large-scale events. Sports events draw huge crowds at peak traffic hours and are therefore a great instance on which to model our project. The Phillies are also undertaking the “Red Goes Green” initiative, which is a push towards becoming more environmentally conscious. Some initiatives that they have taken are the use of solar energy sources for their power consumption and partnering with the Pennsylvania Horticultural Society to plant one million trees to counteract the aforementioned carbon emissions. We believe that our project will be helpful to the Phillies to integrate into their Red Goes Green initiative and further reduce the carbon footprint of the stadium.

When a typical baseball game ends, everyone tries to the leave the stadium at the same time. Although traffic police conduct the traffic, they do it in a haphazard and unscientific manner. Furthermore, the decision of which gates to be open and which ones to remain closed is also done using intuition rather than any efficiency-maximizing algorithm. We saw this inefficient process as an opportunity to develop an algorithm to reduce car idling time and GHG emissions.

\subsection{Project Goal and Objectives}

Although the overarching aim of our project is to reduce GHG emissions due to people going to/from the sports games, we broke this down into certain specific, measurable objectives:

\begin{enumerate}

\item Develop a comprehensive model of transportation to and from the stadium.

\item Quantify the total emissions due to transportation to and from games.

\item Optimally route exiting vehicle traffic according to total emissions generated.

\item Inform fans of the change in travel time and carbon emissions by using public transport rather than cars.

\end{enumerate}

The success of each of the objectives can be measured and how we would measure the success is stated below:

We would consider a success model one that takes inputs such as trip distribution, number of attendees, start and end time and produces outputs such as average idling time and number of cars.

The aim of the project is to reduce GHG emissions, so we need to be able to measure and quantify GHG emissions from idling cars.

Our model should be able to quantify the effect of different incentives on GHG emissions so that we can test different strategies and find the optimal combination.

Optimal routing of traffic can impact GHG emissions from idling cars, so we need to create an algorithm that can take into account which gates are open or closed and simulate appropriate car routing.

A front-end system that allows fans to understand the impact of their decisions would allow our project to have the greatest impact. The system should allow for alternatives should fans decide that they wish to opt for the less environmentally-friendly option. A mock-up of a website would be ideal to accomplish this goal.

\subsection{Constraints}

The main constraint is the cooperation of the Philadelphia Phillies since they would act as our primary data source. Through the course of the project, we had difficulties establishing concrete contact with the Phillies and had to resort to alternative data collection and measurement techniques. However, we have received the Phillies endorsement for our project and hope that it will be officially integrated with their Red Goes Green initiative in the near future.

Another constraint is the team’s lack of experience with transportation engineering.  Since the project involves the understanding, modeling and optimizing of transport systems, this would be a constraint. However, we have taken an initiative to get the help of Professor Vukan Vuchic, a senior professor in transport engineering, and began familiarizing ourselves with relevant transport systems concepts under his guidance.