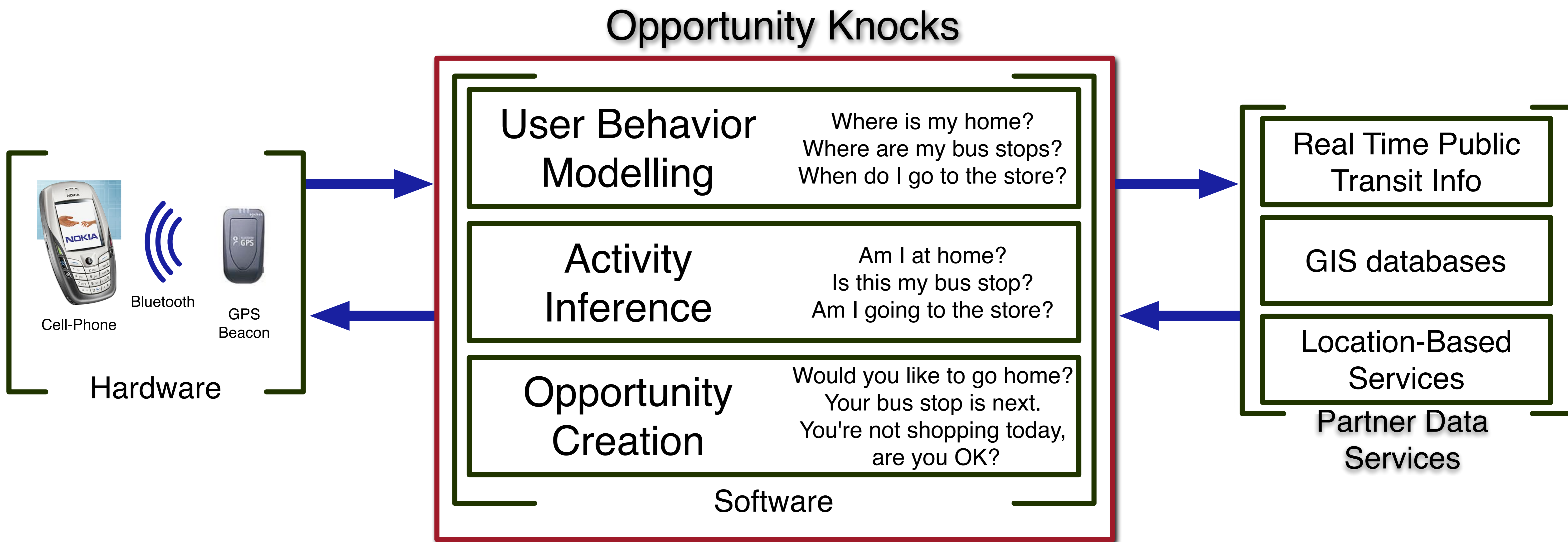


Overview

The goal of the Opportunity Knocks project is to demonstrate the potential for intelligent predictive computer algorithms to support aging in place. We focus on the role that community transit plays in the life of a healthy independent elder. The ability to confidently and safely move through the community directly impacts the degree to which a person can participate in community life, visit family, friends and doctors and shop for the necessities of daily life. In particular we aim to help elders transit in the presence of small cognitive errors that are consistent with very early stage Alzheimer's disease, low-grade age-related dementia as well as the normal aging process.

Our system relies on three components, a hardware platform, a software service and a network of partner data sources. The hardware consists of a next-generation cell phone and a sensor beacon (e.g., GPS location), the software consists of a user behavior modeler, a current-activity inference engine, and an opportunity/error recognizer. The name of the project comes from the door knocking sound that the cell phone plays when it has determined that there are important opportunities that the user needs to be made aware of.



Scenarios



Every Monday, Wednesday and Friday Mary travels downtown on the bus to go shopping. She follows a regular routine, but encounters several challenges. She occasionally will leave one of her regular stores through a different entrance, become disoriented and have difficulty finding her bus stop. Sometimes, she will miss Tuesday appointments because, believing it is Wednesday, she will board a bus heading downtown.

Without any user input, Opportunity Knocks learns routine behaviors and can show them to the user. When Mary becomes confused when she looks at her cell phone, it displays directions on how to continue her regular routine.

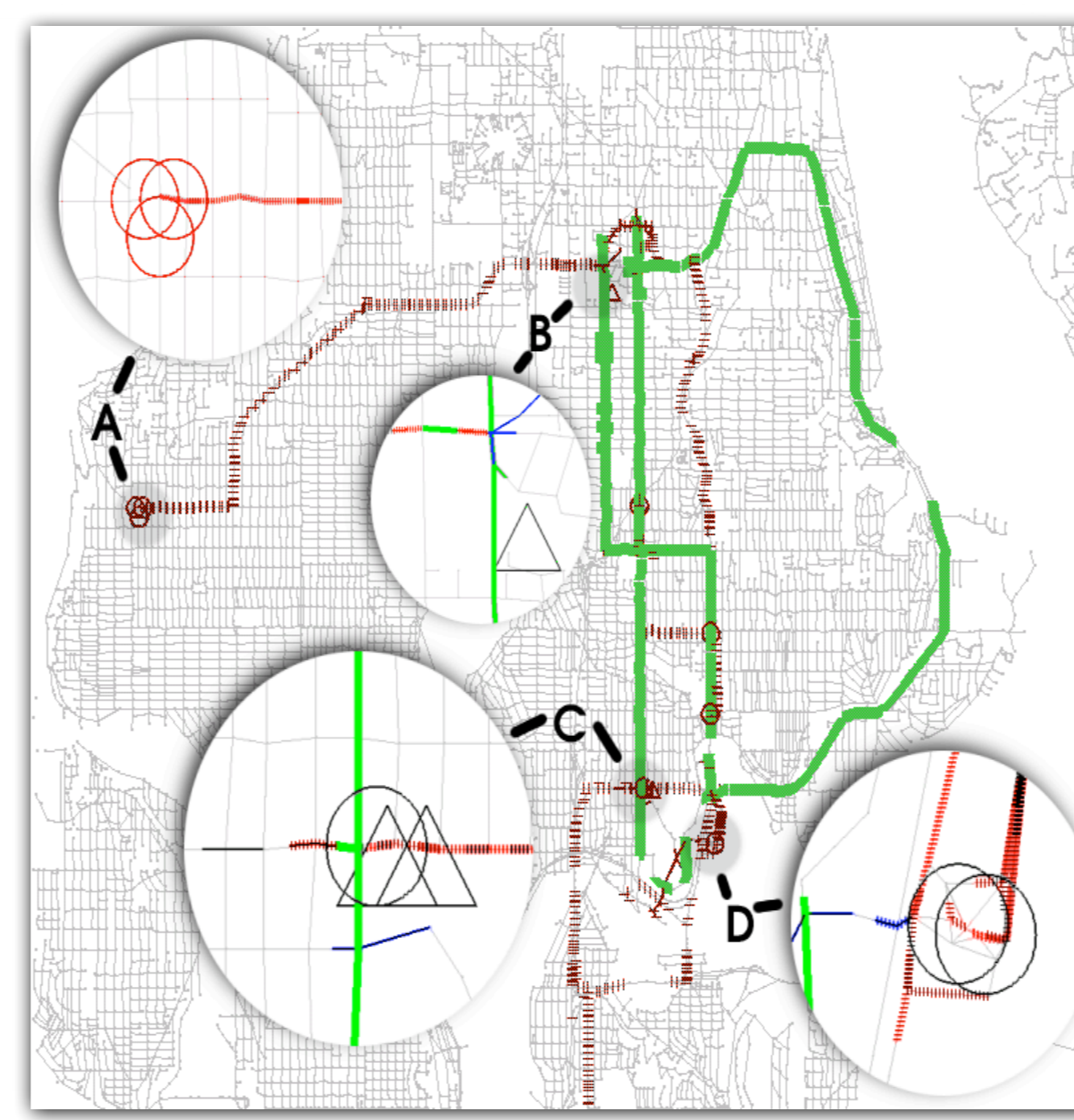
If Mary begins an unusual behavior O.K. will identify the anomaly, possibly ask her to confirm her intentions or alert her trusted care-givers about the deviation.



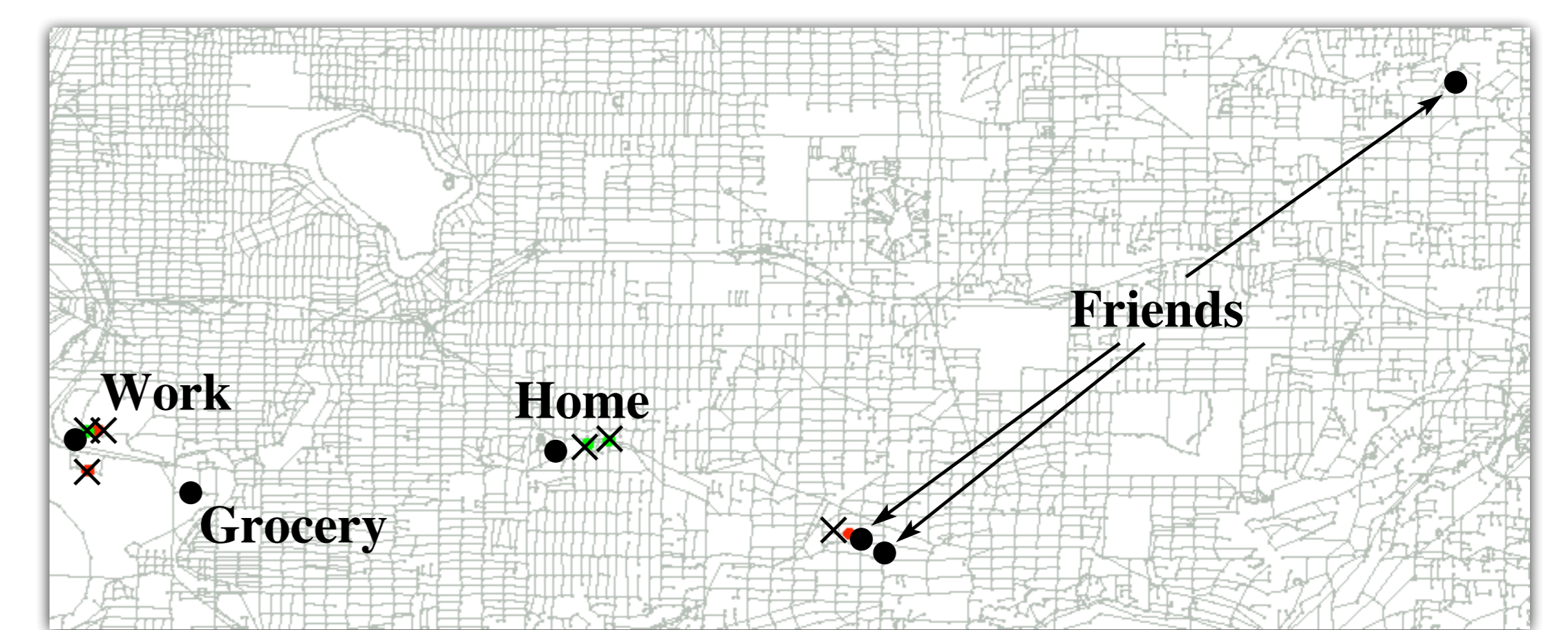
Every Tuesday Bob goes to the senior center to play checkers. Last winter, Bob missed his bus stop and got off several blocks too late. Disoriented, he knew not to wander, but didn't recognize the neighborhood, by the time his family found him, he was suffering from frostbite.

Opportunity Knocks can alert Bob that he has missed his routine bus stop. By selecting the senior center, Opportunity Knocks will find a bus or walking plan to get him there. If Bob is too disoriented to correct, his current location will be sent to trusted care-givers.

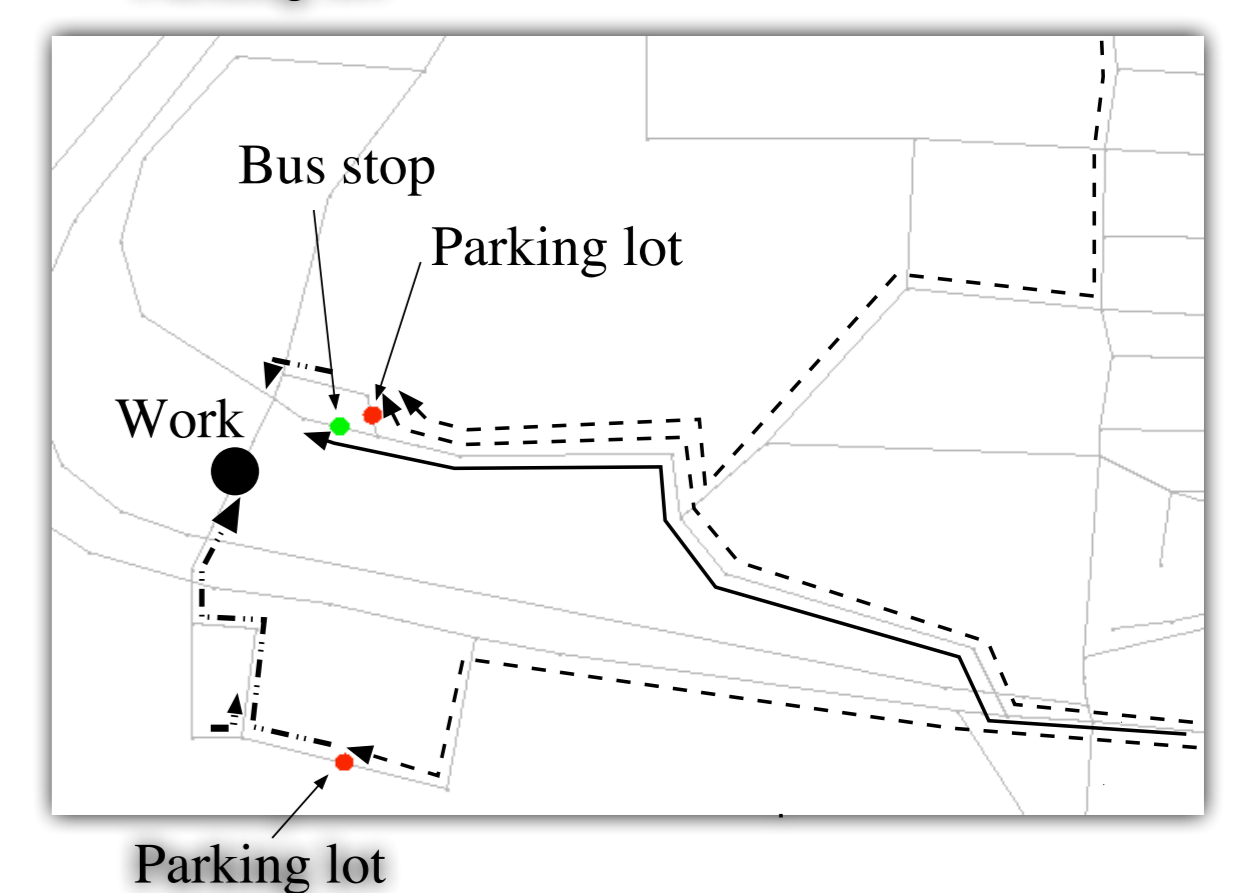
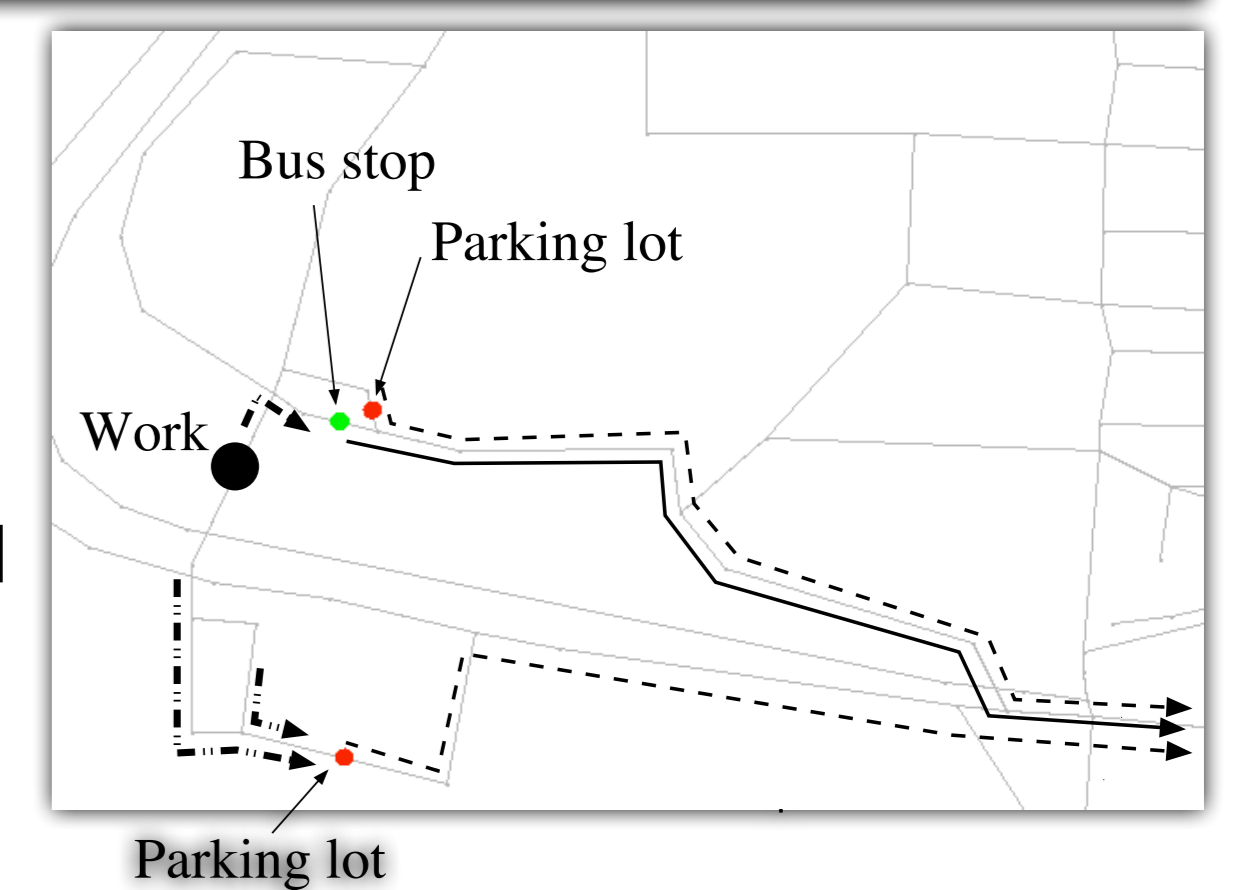
Technical Results



- * Learn routines without any input from the user
 - Learns bus stops
 - Learns bus routes
 - Learns parking lots
 - Learns multi-stage routes



- * Learn significant destinations without any input from the user
 - Learns routine goals
 - Learns frequently used routes between goals



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Enabling Technologies

Bayesian Reasoning

- * Markov Models
- * Hidden Markov Models
- * Relational Markov Models
- * Bayes Nets
- * Dynamic Bayes Nets
- * Probabilistic Relational Models
- * Particle Filters

The Cell Phone

- * Standard Platform
- * Always on
- * Always connected
- * Widely adopted
- * High bandwidth data txfr
- * Always carried on person
- * Substantial computational power

Ubiquitous Sensing

- * GPS
- * WiFi
- * RFID
- * Environmental Sensors
- * Transactional Sensors
- * Always carried on person
- * Substantial computational power

Wireless Technology

- * No cables
- * Rapid device association
- * Rapid device disassociation
- * Bluetooth
- * WiFi