CS 403X Mobile and Ubiquitous Computing
Lecture 14: Google Places, Other Useful Android APIs and Cool Location-Aware Apps
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Google Places

- **Place**: physical space that has a name (e.g. local businesses, points of interest, geographic locations)
  - E.g Logan airport, place type is **airport**

- **API**: Provides Contextual information about places near device.

- **E.g**: name of place, address, geographical location, place ID, phone number, place type, website URL, etc.

- Compliments geographic-based services offered by Android location services
Sample Place Types

accounting
airport
amusement_park
aquarium
art_gallery
atm
bakery
bank
bar
beauty_salon
bicycle_store
book_store
bowling_alley
bus_station
cafe
campground
car_dealer
car_rental
car_repair
car_wash
hospital
insurance_agency
jewelry_store
laundry
lawyer
library
liquor_store
local_government_office
locksmith
lodging
meal_delivery
meal_takeaway
mosque
movie_rental
movie_theater
moving_company
museum
night_club
painter
park
city_hall
clothing_store
convenience_store
courthouse
dentist
department_store
doctor
electrician
electronics_store
embassy
establishment (deprecated)
finance (deprecated)
fire_station
florist
food (deprecated)
furniture_store
gas_station
general_contractor (deprecated)
grocery_or_supermarket
gym
hair_care
hardware_store
health (deprecated)
hindu_temple
home_good_store
physiotherapist
place_of_worship (deprecated)
plumber
police
post_office
real_estate_agency
restaurant
roofing_contractor
rv_park
school
shoe_store
shopping_mall
spa
stadium
storage
store
subway_station
synagogue
taxi_stand
train_station
transit_station
travel_agency
university
veterinary_care
zoo
Google Places API Overview

- **Use Place picker UI:** allows users to select a place from “possible place” on a map.

- **Get current place:** place where the device is last known to be located.
  - Returns a list of likely places along with the likelihood the device is in that place.
Google Places API Overview

- **Autocomplete**: queries the location database as users type, suggests nearby places matching letters typed in.

![Autocomplete example](image)
Google Places API Overview

- **Access high-quality photos** of a place
- Users can also add place information to the database
  - E.g. business owners can add their business as a place in Places database
  - Other apps can then retrieve info after moderation

- **On-device caching**: Can cache places data locally on device to avoid roundtrip delays on future requests
Learning Google Places API

- Official Google Places website is “decent”, up to date:
  - https://developers.google.com/places/

- Tutorial by Paul Trebilco-Ruiz may be more readable:
  - http://code.tutsplus.com/articles/google-play-services-using-the-places-api--cms-23715
Other Useful Google Maps/Location APIs
Other Maps/Useful Location APIs

- **Maps Directions API:** calculates directions between locations (walking, driving) as well as public transport directions
- **Distance Matrix API:** Calculate travel time and distance for multiple destinations
- **Elevation API:** Query locations on earth for elevation information, calculate elevation changes along routes
Other Useful Maps/Location APIs

- **Geocoding API**: access to **geocoding** and **reverse geocoding** services using HTTP requests
  - **Geocoding**: Convert addresses into longitude/latitude coordinates
  - **Reverse geocoding**: convert longitude/latitude coordinates into human readable address

- **Roads API**:
  - snaps set of GPS coordinates to road user was likely travelling on (best fit)
  - Returns posted speed limits for any road segment (premium plan)

- **Time Zone API**: request time zone for location on earth
What other Android APIs may be useful for ubicomp?
Google Now

- Intelligent assistant
- Make recommendations (travel time, traffic, etc)
- Information (e.g. scores from favorite spots teams)
- Works by recognizing repeated user actions on device (common locations, repeated calendar appointments, search queries, etc)
- Displayed as Information “Cards”
Specialized Google Now Cards

https://en.wikipedia.org/wiki/Google_Now

- Activity summary
  (walking/cycling)
- Birthday
- Boarding pass
- Concerts
- Currency
- Developing story and breaking news
- Events
- Event reminders
- Flights
- Friends' birthdays
- Hotels
- Location reminders
- Movies
- Nearby attractions
- Nearby events
- Nearby photo spots
- New albums/books/video games/TV episodes
- News topic
- Next appointment
- Packages
- Parking location
- Places
- Product listing
- Public alerts
- Public transit
- Research topic
- Restaurant reservations
- Sports
- Stocks
- Time to home
- Time reminders
- Traffic and transit
- Translation
- Weather
- Website update
- What to watch
Speaking to Android


- Speech recognition:
  - Accept inputs as speech (instead of typing) e.g. dragon dictate app?
  - Note: Google (remote) service Requires internet access

- Speech-to-text
  - Convert user’s speech to text. E.g. display voicemails in text
Gestures


- **Gesture**: Hand-drawn shape on the screen
- Search your phone, contacts, etc by handwriting onto screen
- Speed dial by handwriting first letters of contact’s name
- Also multi-touch, pinching
More MediaPlayer RenderScript

- Media Player can also:
  - Record audio and video
  - Manipulate raw audio from microphone/audio hardware, PCM buffers
    - E.g. if you want to do audio signal processing, speaker recognition, etc
    - **Project idea:** process user’s speech, detect emotion, nervousness?

- RenderScript
  - High level language for GPGPU
  - Use Phone’s GPU for computational tasks
  - Very few lines of code = run GPU code
  - Useful for heavy duty tasks. E.g. image, video processing
Wireless Communication


- Bluetooth
  - Discover nearby bluetooth devices
  - Communicating over bluetooth

- WiFi
  - Scan for WiFi hotspots
  - Monitor WiFi connectivity, Signal Strength (RSSI)
  - Do peer-to-peer (mobile device to mobile device) data transfers
Wireless Communication


- NFC:
  - Contactless technology
  - Transfer small amounts of data over short distances
  - **Applications**: Share spotify playlists, Google wallet
  - **Google wallet?**
    - Store debit, credit card on phone
    - Pay by tapping terminal
Telephony and SMS


- **Telephony:**
  - Initiate phone calls from within app
  - Access dialer, etc
- **SMS:**
  - Send/Receive SMS/MMS from app
  - Handle incoming SMS/MMS in app
Some Interesting Location-Aware Apps
MileIQ

- **The Problem:** Mileage tracking is useful but a burden.
  - IRS deductions on taxes
  - Some companies reimburse employees for mileage,
- Passively, automatically tracks business mileage, IRS compliant
- Swipe right after drive to indicate it was a business trip
- Project idea? Implement some of this functionality

- **How Android modules? For what?**
- **What stats to decide if this is tackling important problem?**
**Trigger**

- Use geofences, NFC, bluetooth, WiFi connections, etc to set auto-behaviors
  - Battery low -> turn off bluetooth + auto sync
  - Silence phone every morning when you get to work
  - Turn off mobile data when you connect to your home WiFi
  - Silence phone and set alarm once I get into bed
  - Use geofence for automatic foursquare checkin
  - Launch maps when you connect to your car’s bluetooth network

- Project idea? Implement subset of these features

- **What triggers would be useful for a WPI student?**
Tidy

- Use picture meta-data to organize pics for you
  - Location taken
  - Time
  - Date
- What stats to decide if this is tackling important problem?
References

- John Corpuz, 10 Best Location Aware Apps
- Liane Cassavoy, 21 Awesome GPS and Location-Aware Apps for Android,
- Head First Android
- Android Nerd Ranch, 2nd edition
- Busy Coder’s guide to Android version 6.3
- CS 65/165 slides, Dartmouth College, Spring 2014
- CS 371M slides, U of Texas Austin, Spring 2014