

Tizen apps with Context Awareness & Machine Learning

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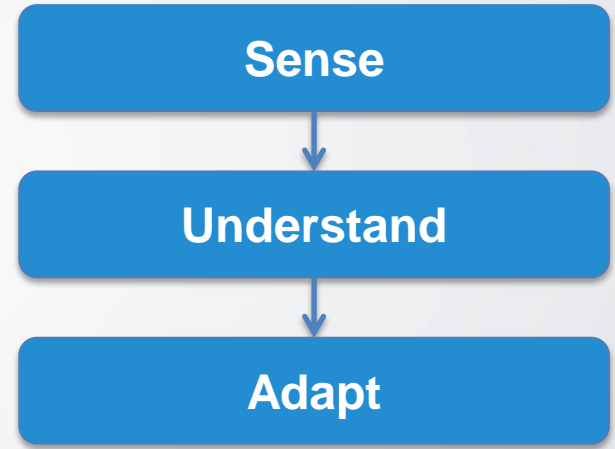
- **Context refers to information that characterizes a situation, between:**
 - Apps
 - People
 - Surrounding environment
- **Contextual apps are also known as **Context aware apps** which understand what is going on **with** and **around** the user**
- **Talk to other apps such as social media, email, messages**

- **Context is about knowing the user**
- **Current location, time, surrounding brightness, user activity, etc**
- **Context today is being used to simplify the users life, simpler interactions & automatic sensing**
- **Compare sensors to human senses to understand the world around**
- **Some contextual experiences:**
 - Alarm based on weather & traffic to work by **location sensing**
 - Phone goes on silent based on **proximity** to office or a movie theatre
 - Reminders based on travel tickets on **email**

- **Lots of new sensors in the user's smartphone**
- **Sensors like the accelerometer can give user activity like running or driving**
- **Combinations of sensors can understand the user better than ever**
- **More sensors with wearables & other IoTs**

Contextual Lifecycle

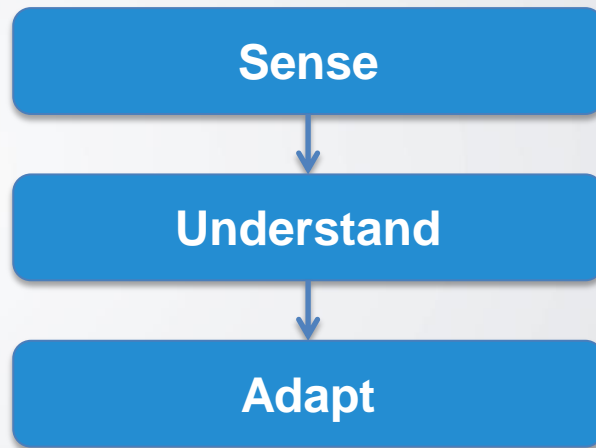
- **Sense, understand and adapt**
- **Get data from sensors or user social networks**
- **Build algorithms to understand the data from sensors**
- **Adapt features & customise UX**



Contextual Lifecycle

e.g. Smart ringtone changer
Turns the phone silent in movie theatres

- **Senses** the location of the device
- **Understands** the place by geocoding APIs
- **Adapts** the phone sound profile to silent



Contextual lifecycle

Five technology forces:

- **Mobile (extended to Wearables)**
- **Social Media**
- **Big data**
- **Sensors (extended to IoTs)**
- **Location-based services**

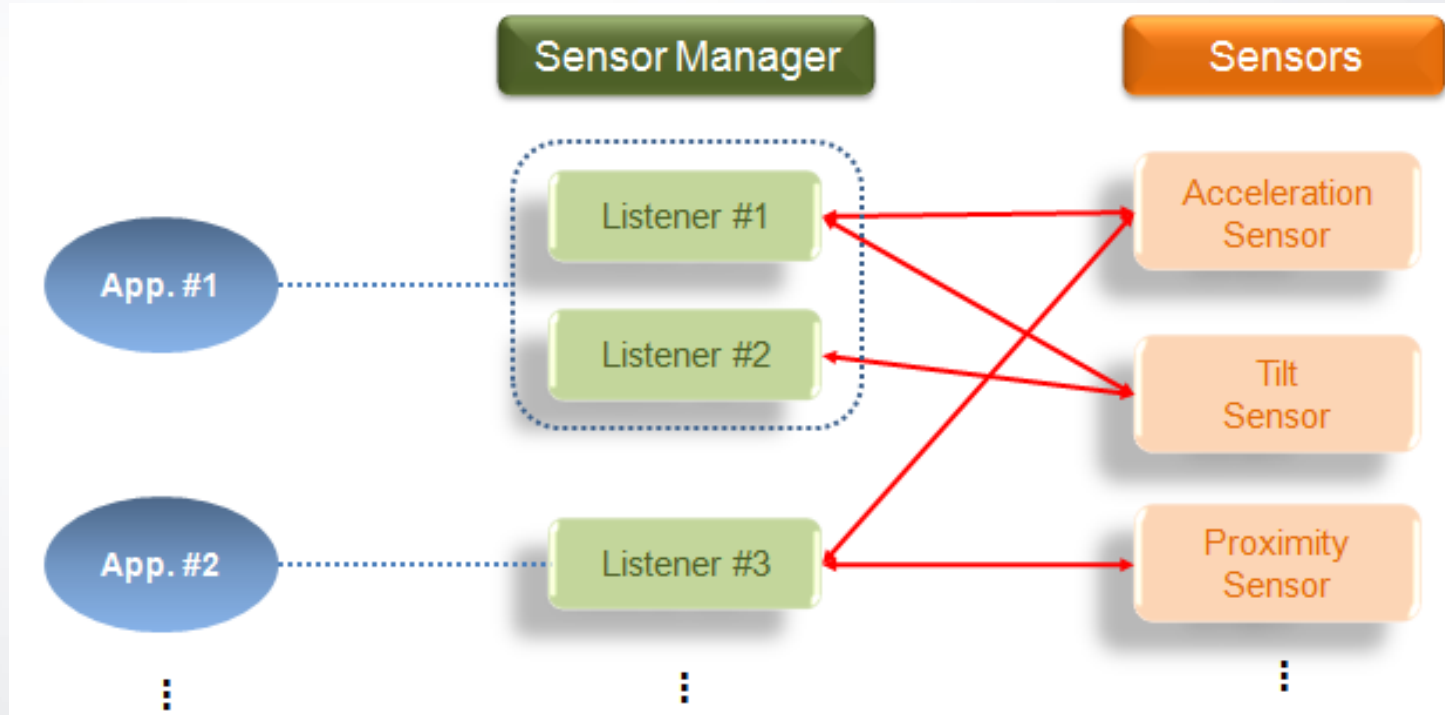


- **Tizen has a large set of in-built context APIs so the apps don't have to do all the processing on the low level sensor data**
- **With Tizen 2.3 Activity & Gesture recognition was introduced**
 - Recognize & react user activities like walking, running, and in-vehicle
 - Recognize & react to gestures like tap, shake, snap, and tilt

- **Average mobile device has 7 sensors**
- **3 out of 5 human senses have been covered**
 - Camera
 - Microphone
 - Capacitive screens
- **Sensors can help the app understand the user environment**
- **Increase the interactive nature of the app**

- **Tizen provides direct access to sensor data through sensor manager class**
- **The sensor manager class can be polled at intervals by your app**
- **Poll sensors only as often as required since they consume battery life**

Sensors



- Reference: developer.tizen.org/...../sensor_manager.htm

- **Construct SensorManager Class**
- **Create a listener**
- **Add or remove listeners with interval values**

```
SensorManager:: AddSensorListener()
```

- **Poll sensors at intervals**
- **Receive sensor data from event handlers at polling intervals**

```
ISensorEventListener::OnDataRecieved()
```

- **Alternative to using sensor manager class is to use:**
 - Activity recognition
 - Gesture recognition
- **Processed contextual data which will be of better quality**

Apart from physical sensors, the mobile has lots of user data

- **Contact Device API**
 - **Messaging Device API**
 - **CallHistory API**
 - **Context FW**
-
- **For example movie tickets, flight tickets or entire vacation itineraries can be parsed through Emails and SMSs'**
 - **Adding a personalized touch of context to a your application**

- **Extract the power of Social Media and Big Data through social APIs**
- **Foursquare Places Explorer**
- **Baidu geocoding and reverse geocoding**
- **Sina Weibo REST API**

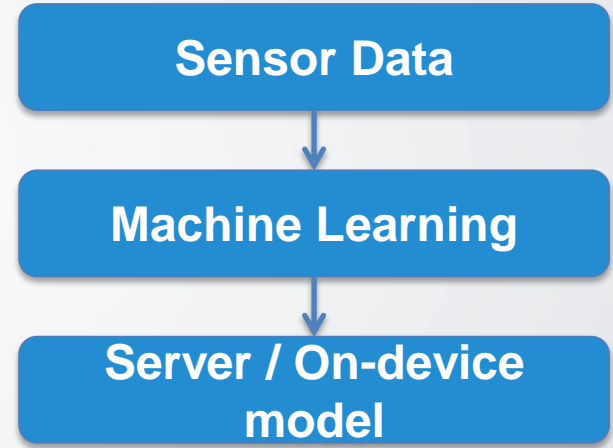
Sense the user's digital life with social APIs

Applying Machine Learning

- **ML algorithms learn from and make predictions on data**
- **ML algorithms work on models have to be made based on sample inputs**
- **Enables context prediction – which sensor data is more important**

Applying Machine Learning

- **Using a combination of sensors, Machine Learning models can be used to determine user activity**
- **Extract sensor data and train ML models**
- **Multiple context data used together can give more specific information about user**
- **E.g. Accelerometer & Barometer can be used together to detect walking vs cycling**



- **ML algorithms make sense of noisy/conflicting data from sensors**
- **Large datasets are useful to train & fine tune Machine Learning models**
- **ML algorithms use raw sensor data to churn out signals like high level activities**

- **Launchify- Contextual app shortcuts app by Emberify**
- **Context triggers**
 - Time
 - Location
- **The app tracks when and where the user uses which apps**
- **According to that makes predictions of which app the user needs right now**
- **Recommends top six apps as a widget**

- **Contextual app shortcuts by Emberify**
- **To sense it uses geofences for home & work in addition to time**
- **This data is stored in a SQLite database**
- **Depending on the current context it studies previous trends of apps based on the place and time**
- **Adapts the algorithm based on which point of context is more relevant for the user**
- **Based on this it predicts which top 6 apps the user might use**

Learning from data and making predictions on data

- **What I have learnt from while building context aware systems:**
- Some common sense assumptions are needed in addition to the sensor data based on general human behavior to get more accuracy
- Sometimes sensors can give us conflicting data
- Use multiple sensors to confirm it
- Common sense logic can be applied to the algorithm like repeating of a certain event occurrence before counting it since it can even be a random event

Use Cases

- **Simplifying UX**
 - Action based on activity or event

- **Lifelogging**
 - Automatic Tracking
 - Quantified Self
 - Personal Analytics

- **Smart Recommendations**
 - Personalized discovery

Use Cases

- **Current apps can be re-imagined by adding context to them**
- **Things will be more automatic and seamless for users**
- **A more personal touch will be provided by adding the contextual fabric**
- **New value propositions for the users offering developers a new market**

- **New UI/UX with contextual experiences**
- **App UI is getting less important and smart notifications is the new interface**
- **Information as a widget or notification**
- **Apps like Foursquare provide you the information when you need it**
- **Eg. Tips when you reach a restaurant**

- **Contextual Notification becoming a priority while designing for the wrist**
- **Low screen estate**
- **Minimal interaction**
- **Input methods are limited**
- **Making it perfect for contextual experiences**



- **Context to customize user experience**
- **Adaptive UI/UX**
- **Based on environmental conditions**
- **Examples of adaptive user experiences:**
 - Dark/Light theme based on ambient light sensor
 - Media volume based on sound in environment based on microphone
 - UI according to orientation

- **Wow factor in apps like Foursquare**
- **Automatically knows which restaurant the user is at and provides recommendations**
- **High utility features been triggered automatically through contextual triggers**
- **Ideal contextual experience**

Privacy limitations

- **Some apps are going over the freaky line**
- **Making users nervous with their personal information**
- **For example Nokia's Trapster allows the user's location to be stalked precisely**
- **System lacking privacy**
- **Disclose information with a privacy policy**
- **Should be allowed to disable the service**
- **Encryption & security protocols if data is being stored or processed on a server**

Battery limitations

- **Data should be polled only when required**
- **Low battery sensor polling should stop or be reduced**
- **Share data between apps**
- **Rather than going to the sensor every time it would be more efficient to get data through an app that just polled the data**
- **E.g. Use location from cellular towers rather than GPS is accuracy isn't that important**

Other Limitations

- **Machine learning algorithms aren't perfect**
- **Location has inaccuracy based on GPS sensor**
- **Allow the user to correct or a manual method of insertion**
- **E.g. Slow driving can be confused as cycling**

- **New context with Tizen 2.4b**
 - **Maps Service** with geocoding, place discovery & routes
 - **Context FW**
 - Context-aware app-launching and notification rules, based on time, several device status and events, and communication events.
 - Contextual History APIs have been added for getting device usage statistics, eg. Which app the user uses the most
- Geofence Manager

- **Ideas**

- Contextual reminders app using places instead of time
- Application stats for Quantified Self apps
- Interactive games based on location

- **IoT's are bringing in new ways sense the user's environment**
- **With smart cars & smart homes we can get more information about the user**
- **Apps that use context will be automatic and seamless with more sensor data**
- **Headless apps – Running in the background, minimal user interaction**

Questions

Thank You

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Emberify

<http://emberify.com>

