IOT SYSTEM FOR PUBLIC HEALTH AND SAFETY MONITORING WITH UBIQUITOUS LOCATION TRACKING

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Content

- Recap on objectives, system architecture and work packages
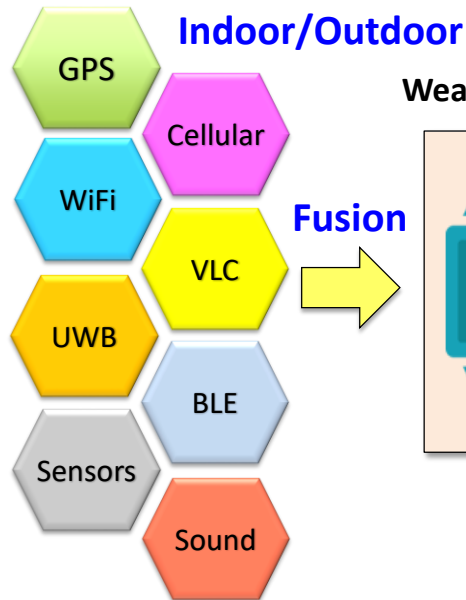- Progress
- Issues
- Moving forward

IoT System for Public Health and Safety Monitoring with Ubiquitous Location Tracking
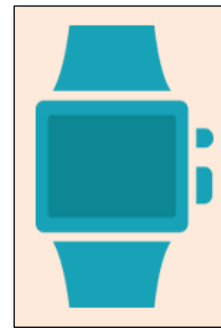
Develop a system which enables tracking of location, lifestyle and health status in promotion of public health and safety in ASEAN countries taking into consideration ASEAN culture, lifestyles, behaviours and infrastructures
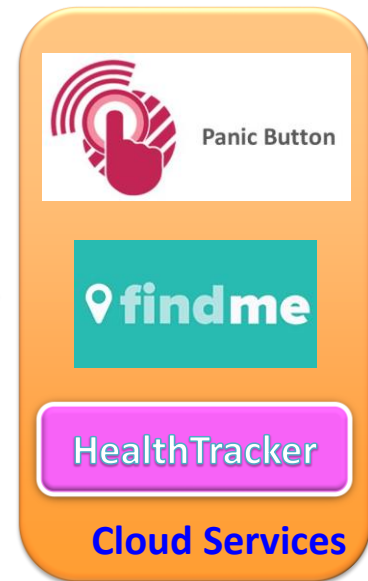
Localization Technologies

Safety (Location) & Health Tracking

Indoor/Outdoor

- GPS
- Cellular
- WiFi
- VLC
- UWB
- BLE
- Sensors
- Sound

Wearable Device

Fusion

Track

Panic Button

findme

HealthTracker

Cloud Services

Budget, Timeline and Overall Architecture

- Total budget = USD 77,900
- Duration = 2 years (April 2017 – March 2019)

Work Packages

Work packages	Deliverables	Form of deliverables
1. Mobile/Embedded Platform (Lead: MIMOS/NICT) Design and implementation of embedded platform that supports continuous location tracking and motion reasoning on commercially available smartphones or specially designed, low-cost and energy-efficient wearable devices	• Mobile platform • Embedded device	• Platform SDK, software libraries • Prototypes (hardware, software, testbed)
2. Multimodal Geospatial Localization Module (Lead: MICA) Development and integration new multimodal geospatial localization technologies which opportunistically harvest heterogeneous signals available for localization such as GPS, GSM, WiFi, Bluetooth, UWB, sensors in order to realize ubiquitous location tracking anytime anywhere	• Multimodal localization module/algorithms • UWB, WiFi, BLE, GPS, sensors	• Algorithms, performance results, publications • Prototype demo
3. Motion Reasoning Module (Lead: UBD) Development and integration of Motion Reasoning module based on UBD's hybrid OS architecture	• Motion reasoning module/algorithms	• Algorithms, performance results, publications • Prototype demo

Work Packages

Workpackages	Deliverables	Form of deliverables
4. Server Monitor and Analytics (Lead: MIMOS) Development of server-end modules to monitor and analyze citizen's lifestyle, health and location. Using Mi-MIST platform to host data and analytic modules	• Server monitoring/ analytic module • System integration	• Monitoring/analytic platform, prototype software • Use cases/demo apps
5. Pilot Trials (Lead: Depending on location) Pilot trials in selected ASEAN cities such as Hanoi, Kuala Lumpur and Bandar Sri Begawan. Ideally such trials are to be performed with local mobile operators	• Trials • Selected application e.g. people tracking	• Reports • End users' feedbacks

Progress

- **Meeting in Hanoi (April 2018)**
  - Work/budget planning and resolving issues
- **MIMOS WiFi-based Indoor Location Platform (Mobile-based)**
  - IOI City Mall, Empire Subang Gallery, Malaysia (trial results published in MCAIT 2018, Kuching)
  - Chatuchak Market, Bangkok (app in Playstore & Appstore)
  - WiFi Tag with LORA backhaul – integration with location platform in progress
- **NICT's IR-UWB testbed setup @ MIMOS**
  - Integration into MIMOS location analytics system in progress
  - Ongoing work on precision improvement
- **MICA's Multimodal Geo-Localization Module**
  - Developed a combination model for indoor localization using smartphone sensors
  - Results presented in IPIN 2018, France. One journal in progress.
  - Testing of MIMOS Mi-ILP platform in progress

Progress

- **UBD's Motion Reasoning Module**
  - Developed a smartwatch application and tested with two case studies in order to monitor human motion using cloud computing.
  - Results presented in FTC 2018, Canada. Extension to journal under consideration
- **Completed the initial training and joint effort with Gifu University in Gifu in June 2018.**
  - One Ph.D. student and Postdoctoral candidate from Gifu together with an MSc student from UBD will be working on mixed reality processing for motion reasoning module.
  - One Gifu University Ph.D. candidate will be attached as an internship to Motion Analysis Lab at UBD starting from January 2019 for a semester to work on this motion reasoning module.
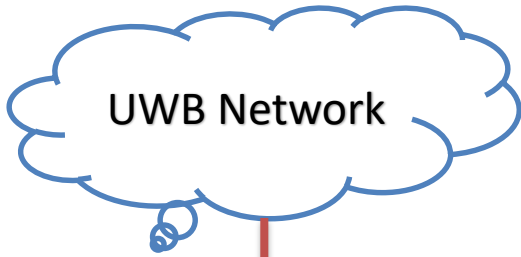
CHATUCAK MARKET LOCATION NAVIGATOR

Provides convenience of knowing a user's position both outdoor and indoor and advice navigation path to required destination on a map. Used for location based services like targeted advertisement and target tracking.
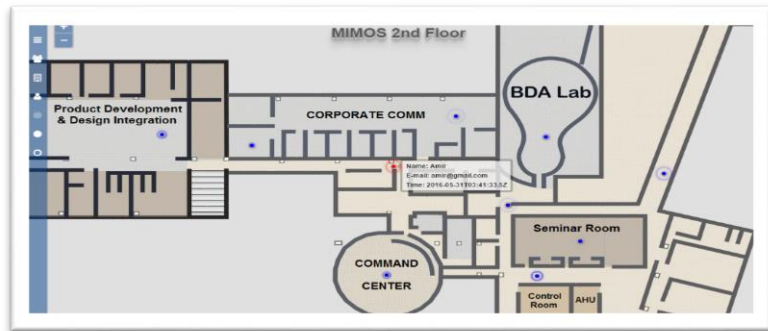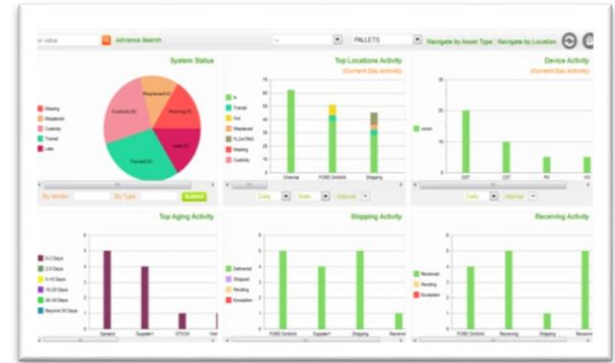
IR-UWB Setup (In progress)

NICT

UWB Network

Mi-MIST

Harvest and process raw
location data

MIMOS

- WiFi for fingerprinting and localization
- LORA for backhaul connectivity

IPIN 2018, France

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Proposed Timeline

Official project period: April 2017 – Mar 2019

Work package	2017-2018				2018-2019			
	April	July	Oct	Jan	April	July	Oct	Jan
WP1	Platform development							
WP2		Module/algo dev			Integration	Testing & tuning		
WP3		Module/algo dev			Integration	Testing & tuning		
WP4					Integration	Testing & tuning	analysis	
WP5							trial	trial

ACTUAL

PLAN

Issues

1. WP 3: Smart shoe equipment yet to arrive due to various unforeseen complications during purchasing. Also stock shortage in US. Estimated to arrive in early January 2019.

2. WP 2: Due to unforeseen regulatory complications in importing IR-UWB devices from NICT to Malaysia which is subjected to import permit, special government approval, etc. The originally plan which was to get the testbed up in Malaysia by End Jan 2018 has been delayed to end Sep 2018.

Moving Forward

- As the universities are entering vacation season, we can only kick start the planned remaining works (~1 year) effectively around **Jan/Feb 2019**.

- Students require one year to complete their FYP, it is best to extend the completion time to **March 2020**.

Summary of Outputs

- **3 Publications**
  1. MCAIT 2018, Kuching - MIMOS
  2. FTC 2018, Vancouver - UBD & MIMOS
  3. IPIN 2018, France - MICA
- **3 Patents:**
  1. 3 filed at MyIPO by MIMOS
- **5 Testbeds/Trials/PoCs:**
  1. IOI City Mall & Empire Subang Gallery, Malaysia – Mobile WiFi-based
  2. Chatuchak Market, Bangkok – WiFi + GPS
  3. MIMOS Lab – WiFi, BLE, UWB, Sensor-based positioning
  4. Pervasive Spaces & Interaction Lab, MICA – Combined WiFi-BLE and sensor fusion localization algorithms
  5. Motion Analysis Lab, UBD – Smart Gait for health monitoring (in progress)
- **2 Public exhibitions, demos**
  - HOTS Expo, Oct 2018, KL
  - Cloud convention, Oct 2018, KL
  - Many in-house demos

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