“Hop-On”
IoT Solution for Bicycle Sharing

Proposal for “LTA Challenge -
Shape The Future of Land Transport”

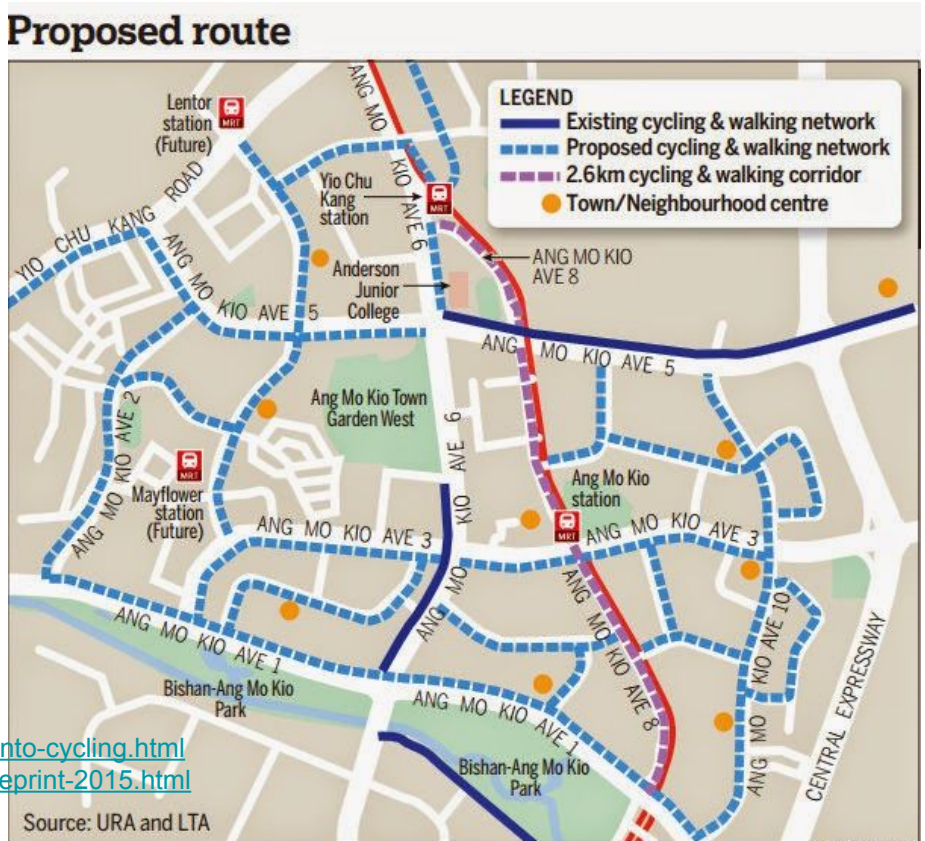
Ngee Ann Polytechnic
School of Engineering
Electronic & Computer Engineering Division

Self-Service Shared Bicycle - Introduction

- Singapore Blueprint 2015 plans to turn Singapore into a ‘car-lite’ nation.
- Public transport system has to be supplemented by access to taxis, car-sharing and bicycles.
- More cycling path and facilities to be built to encourage cycling.
- Does everyone need to own a bicycle?
- Public transport is good for longer distance commuting and bicycle is suitable for travelling with the community.
    - No need to carry bicycle while taking public transportation
- How can we encourage sharing of bicycles within community?
    - Convenient
    - Responsible sharing - accountability

Self-Service Shared Bicycle - Introduction

- Turn Ang Mo Kio and Tampines into cycling town by 2018 to test-bed ideas
- Extend cycling path from 213 km to 700 km



http://www.walkandcycle.sg/MS/walkandcycle
http://ifonlysingaporeans.blogspot.sg/2015/01/plans-to-turn-ang-mo-kio-into-cycling.html
http://ifonlysingaporeans.blogspot.sg/2014/11/sustainable-singapore-blueprint-2015.html

Existing Bicycle Sharing Systems

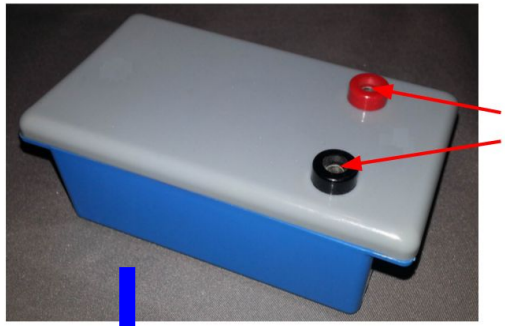
- Heavy investment and not easy to expand
  - Special facility to return/park/lock bicycles, and make payments.
- Not convenient
  - Can’t search for bicycle
  - Can’t book a bicycle in advance.
  - User have to safeguard the bicycle during loan period.
- Not smart
  - Cant’ track usage and use data to improve service quality

Proposed Bicycle Sharing System - “Hop-On”

- An IoT solution which enable users to share bicycle in convenient way
- The system contains following three components
  - Hop-On Module (mounted on bicycles)
  - Hop-On Station (installed at parking areas)
  - Hop-On App & Server (mobile app client and server)

Proposed System - “Hop-On” Module (1)

- Module to be mounted on every bicycle
  - E-lock and anti-theft alarm system
  - Sense any unauthorised manipulation of the bicycles
  - Report bicycles’ location
  - Able to communicate with user mobile phone and control box at parking



	Controller	
	GPS	Alarm
Motion	BLE	LED
Rechargeable Battery		

Proposed System - “Hop-On” App (2)

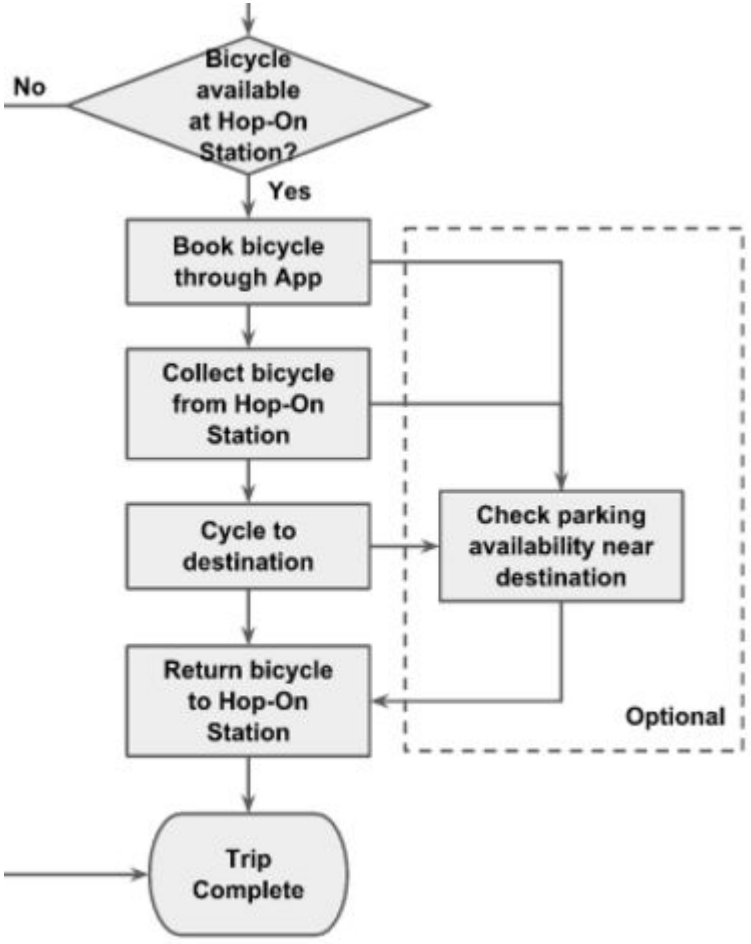
- A mobile app which allows users to
  - Search, book available bicycles at nearby “Hop-On” Stations.
  - Activate and de-activate the e-lock system on bicycle.
  - Returning of bicycle at a “Hop-On” station.

Proposed System - “Hop-On” Station (3)

- A designated the bicycle parking area equipped with a Control Box.
  - Available at strategic locations, e.g. HDB blocks, MRT stations, bus interchange
  - Sense the presence of Hop-On modules on bicycles
  - Monitor the status of bicycles and upload onto server
  - Enforce the security of the bicycles through e-lock system and surveillance camera.

Proposed System - How it works

- User registration through mobile app
- Find and book a nearby bicycle through app
- Locate the bicycle and unlock it throup app
  - A locked bicycle will sound its alarm if it is rided illegally.
- Mobile app will keep track of usage
- User returns the bicycle at a “Hop-On” Station
  - E-lock on bicycle will be activated upon returning of the bicycle.



Proposed System - Benefits

- Low cost, simple implementation
- Rugged bicycle, low maintenance
- User friendly
- Keep healthy lifestyle
- Shared accountability
- Save time and money
- Enjoy convenience and freedom

Conclusion - “Hop-On” System

- A convenient solution for sharing of bicycles.
- Based on Internet of Things (IoT) concept and can be implemented with readily available technologies.
- Users can easily locate, book, lock and return bicycles through their mobile phone.
- Potential solution for the “last mile” transportation at HDB towns or industrial parks.