

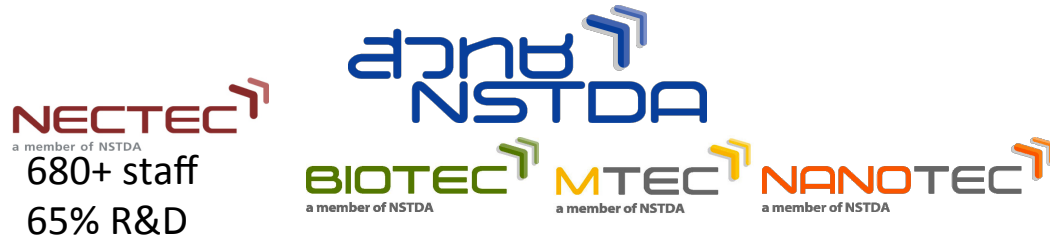
Big Data Analytics: Driving Behaviour Analysis from Smartphone Sensory Data

Chalermpol Saiprasert, Ph.D.
NECTEC Thailand

Outline

- Introduction to NECTEC
 - Research labs and core technology
- Behaviour Inference Lab
 - Research areas and interests
- On-going Big Data Analysis Research at NECTEC
- Driving Behaviour Analysis using Smartphone Sensory Data
 - Real world application
 - Use cases

Introduction to NECTEC



Part of Thailand Science Park with 47 acres
Located in Pathum Thani (45 mins from Central Bangkok)

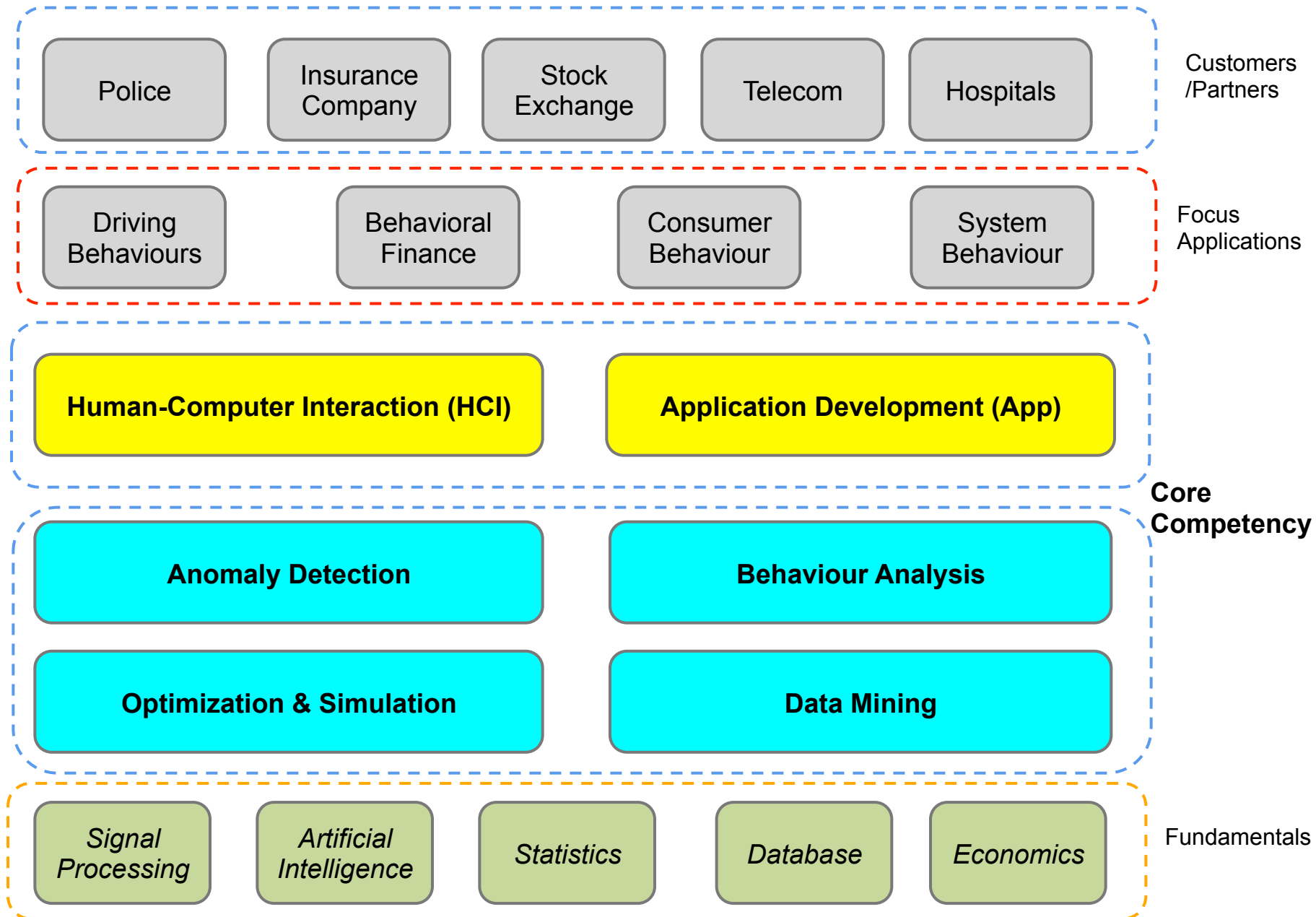
NECTEC Research Units

- **Intelligent Informatics Research Unit (INIRU)**
 - Digital Media Informatics Lab (DMI)
 - Speech Processing Technology Lab (SPT)
 - Language and Semantic Technology Lab (LST)
 - Image Technology Lab (IMG)
- **Biomedical Electronics and Systems Development Unit (BESDU)**
 - Rehabilitation and Assistive Technologies Lab (RHA)
 - Biomedical Signal Processing Lab (BSP)
 - X-Ray CT and Medical Imaging Lab (CTI)
 - Healthcare Systems and Data Analytics Lab (HDA)
- **Information Communication and Computing Research Unit (ICCRU)**
 - Large Scale Simulation Research Lab (LSR)
 - Network Technology Lab (NTL)
 - Intelligent Transportation Systems Lab (ITS)
 - Knowledge Elicitation and Archiving Lab (KEA)
 - Behaviour Inference (MBI)
- **Innovation and Engineering Development Unit (IENDU)**
 - Industrial Prototype and Product Development Lab (IPP)
 - Standard and Testing Development Lab (STD)
 - Software Engineering and Service Innovation Lab (SSI)

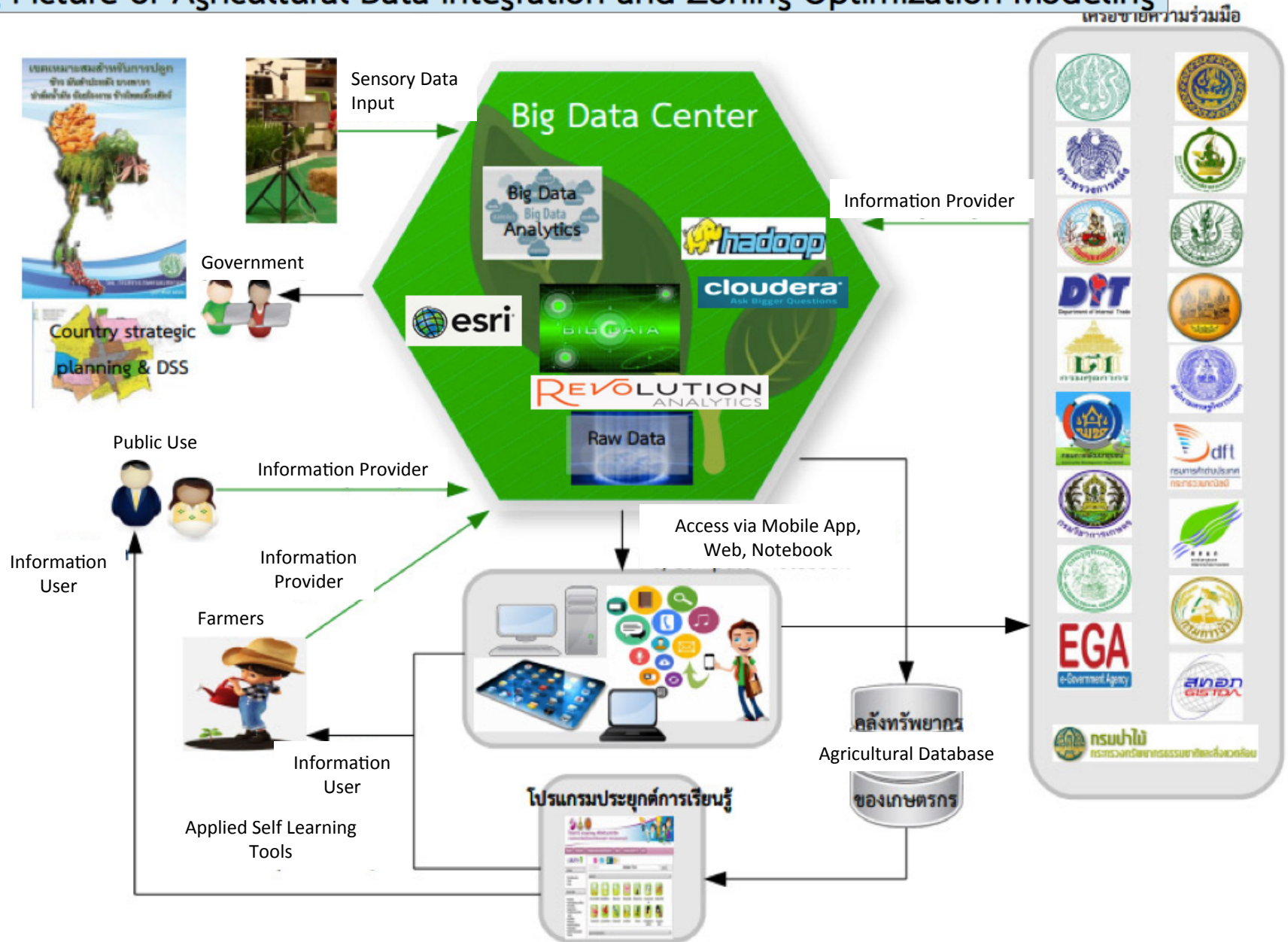
NECTEC Research Units

- **Advanced Automation and Electronics Research Unit (AAERU)**
 - Embedded System Technology Lab (EST)
 - Automotive Electronics Lab (AEL)
 - Intelligent SCADA Lab (ISL)
 - Advanced Automation System Lab (AAS)
 - Machine and Drive Design Lab (MDD)
- **Intelligent Devices and System Research Unit (IDSRU)**
 - Photonics Technology Lab (PTL)
 - Nano-Electronics and MEMS Lab (MEM)
 - Solar Energy Technology Lab (STL)
 - Optical Thin-Film Lab (OTL)
- **Wireless Security and Eco-electronics Research Unit (WISRU)**
 - Eco-Green innovations Lab (EGI)
 - RF Electronics Lab (RFE)
 - Wireless Network and Protocol Lab (WMP)
 - Information Security Application Lab (ISA)
 - Cybersecurity Lab (CSL)
- **Thai Microelectronics Center (TMEC)**
 - Microelectronics Research and Development Division (MRD)
 - Engineering Division (ENG)
 - Production Section (PDTS)
 - Marketing Section (MKTS)
 - Administration and Support Section (ADSS)
 - Integrated Circuits Design Section (ICDS)
 - Quality, Safety and Environment System Section (QSES)

Behaviour Inference



Big Picture of Agricultural Data Integration and Zoning Optimization Modeling



Driving Behaviour Analysis using Smartphone Sensory Data

Driving Behaviour Analysis using Smartphone Sensory Data

Fatality rate per 100,000 population from road crashes



- Thailand ranked *second* in the world (2013)
- 44 fatalities per 100,000 population



Rank	Country	Rate
1	Namibia	45
2	Thailand	44
3	Iran	38
4	Sudan	36
5	Swaziland	36
6	Venezuela	35
7	Congo	34
8	Malawi	32
9	Dominican Republic	32
10	Iraq	32
11	Central African Republic	32
12	Mongolia	31
13	Belize	31
14	Djibouti	30
15	Lesotho	30
16	Mozambique	30
17	Malaysia	30
18	El Salvador	29
19	Yemen	28
20	Ethiopia	28

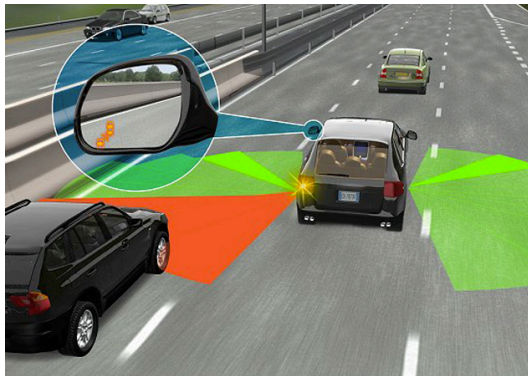
Loss of lives and Money

**source: University of Michigan Transportation Research Institute

Existing Active Safety Technology

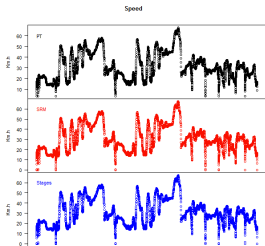
- Advanced Driver Assistance Systems (ADAS)

- Adaptive Cruise Control
- Blind Spot Detection
- Collision Avoidance System
- Driver Drowsiness Detection
- Lane Departure Warning System



Only available in selected cars → not accessible by everyone!!

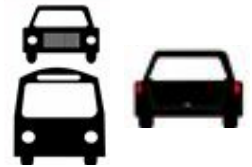
Alternative Solution: Smartphone



010101011010110101000
011110100001110101010
001110100001101000000
001110101010000001100
00110100001110101010
10101001000101010110
010000010101111010000

Driving Behaviour Evaluation Platform using Smartphone

- Portable
- Customisable: Just update the app
- Low Cost: Smartphone starting at 3000 THB
- Based on numerous sensors: GPS / Accelerometer
- Fully customisable platform



Enterprise Version
Vehicle Monitoring



Detect
Driving
Events

Real-time
Alert when
Dangerous

Compute
Driving Score

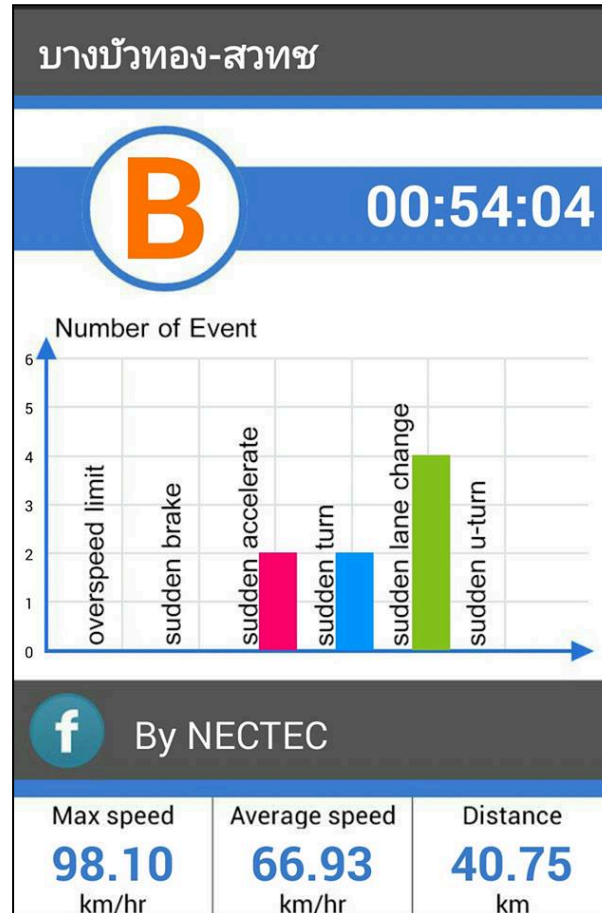
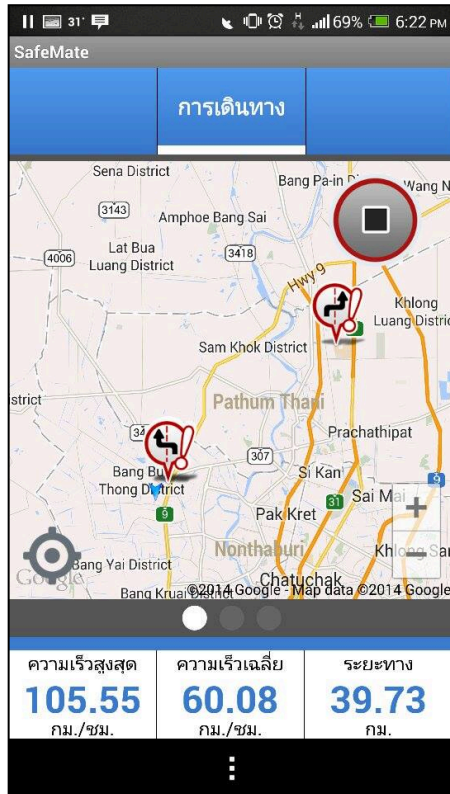
Record Log
History per
Trip



A B C D F

Personal Version

SAFEMATE



What is it?

Driving Style Evaluation Tool
Provides driving score

Price?

Free

Which platform?

iOS and Android

Availability?

Thai and English

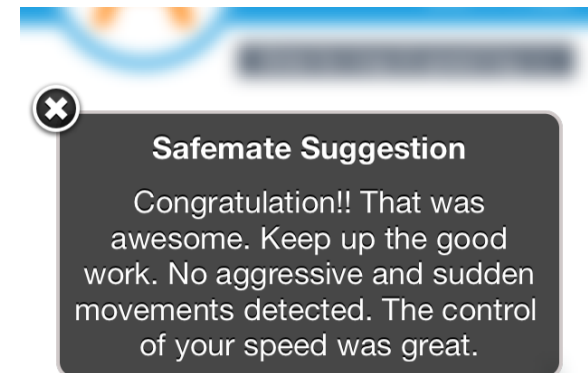
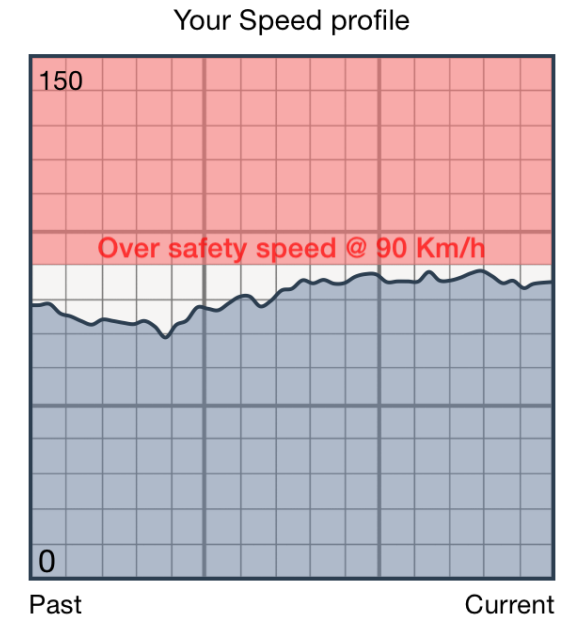
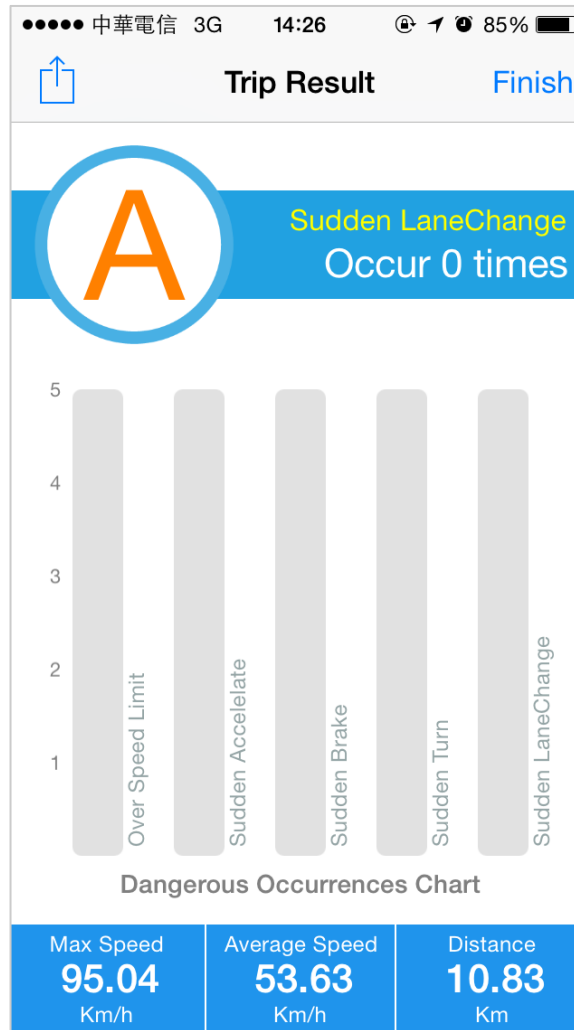
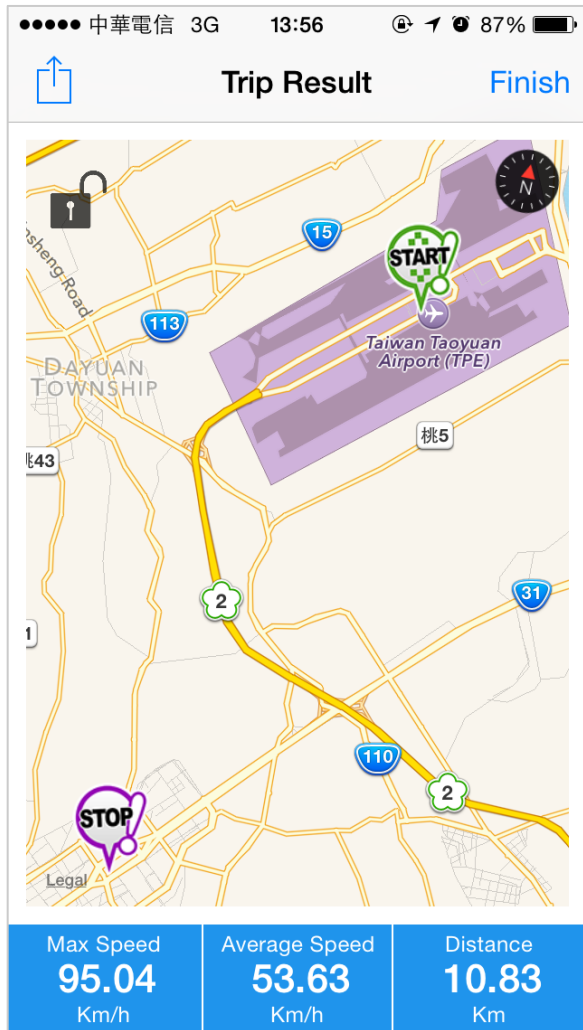
Can be used world wide

Download from?

App Store and Google Play



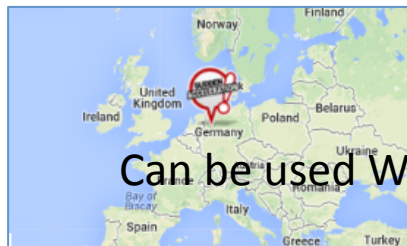
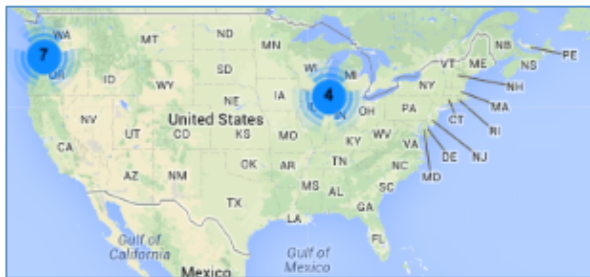
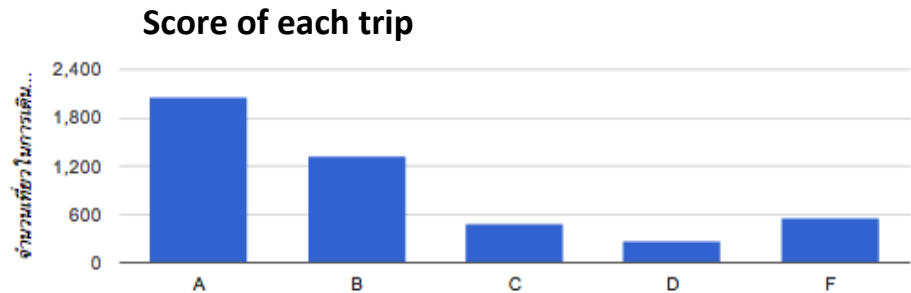
Tested in Taiwan!



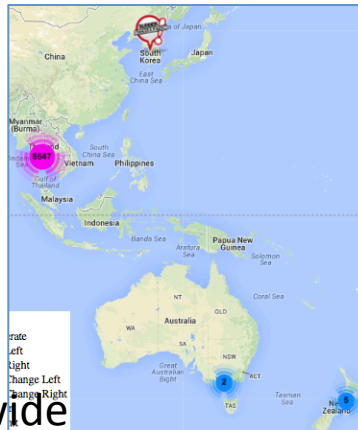
A Bus ride from Airport to High Speed Train Station

Personal Version : Usage Statistics

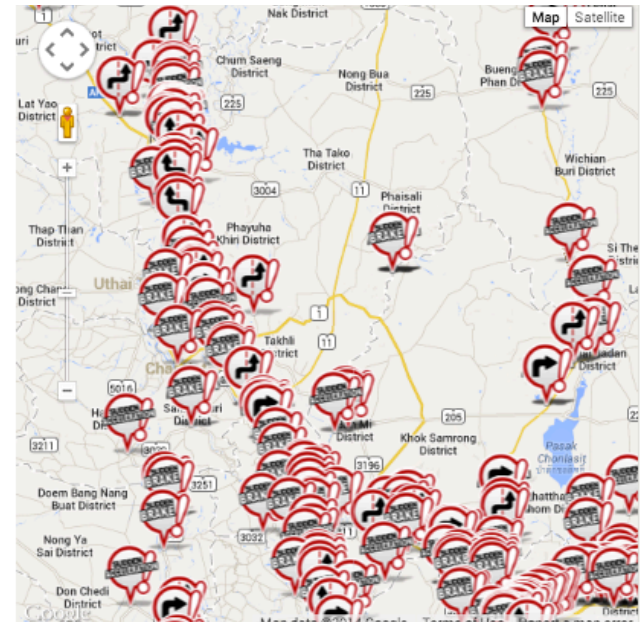
- Launched during Songkran (Thai new year) April 2014
- Number of apps download October 2014 = **42,000** downloads



Can be used World-wide

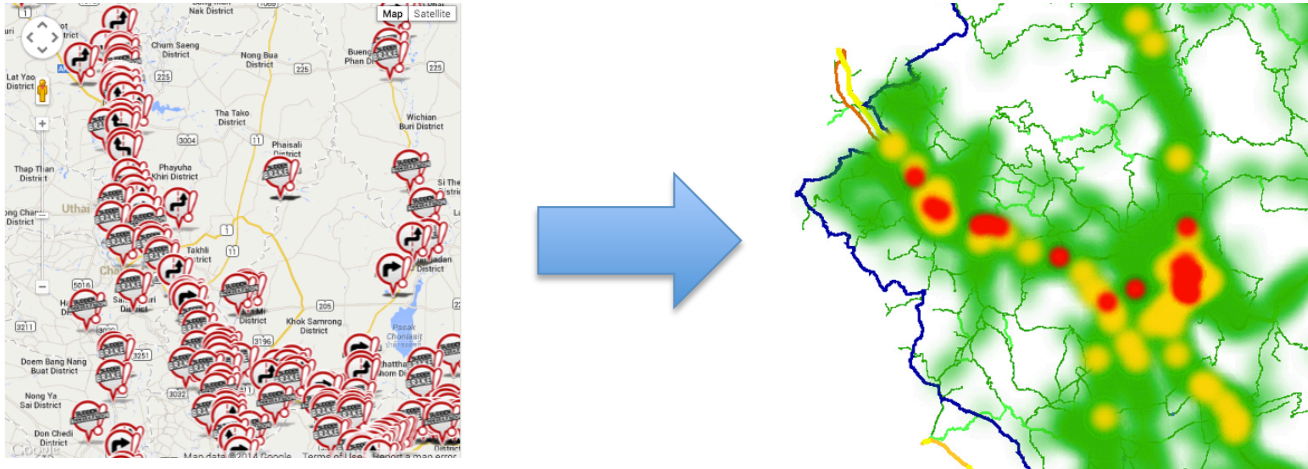


Location of sudden driving events

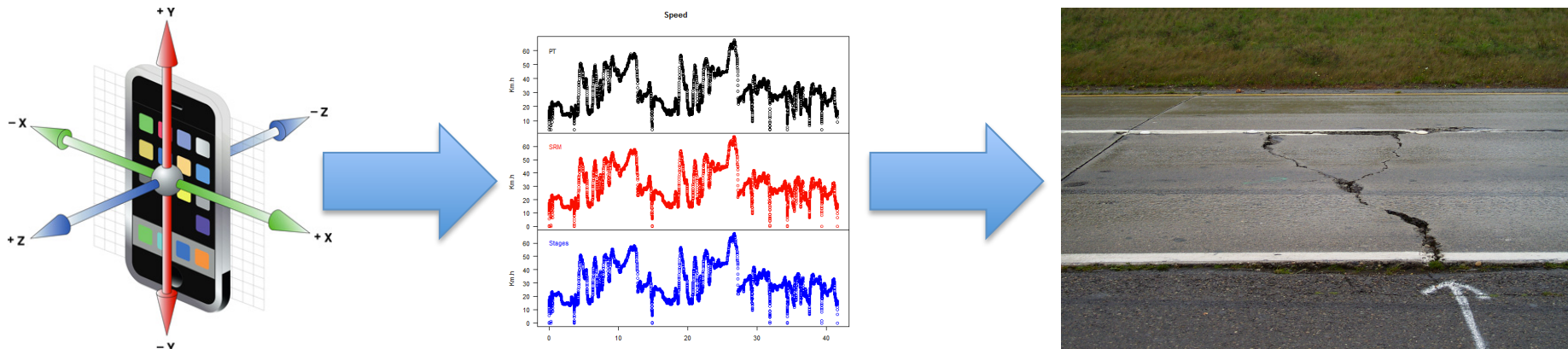


Big Data Analytics

1. Locate Accident Prone Spots

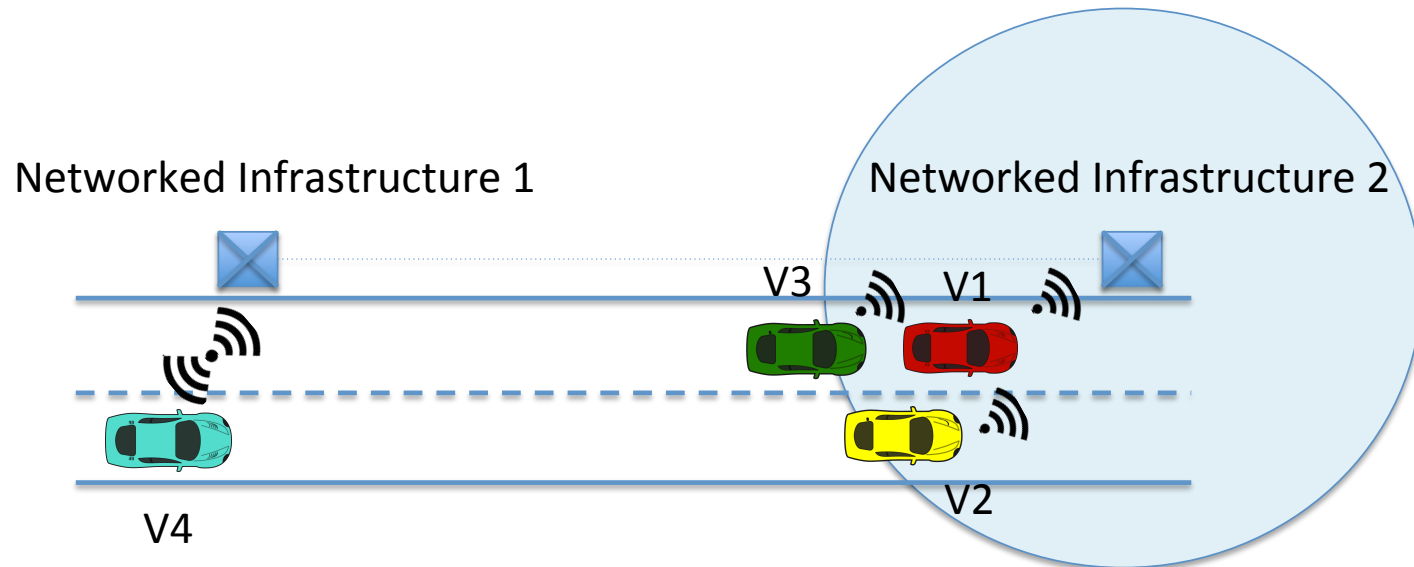


2. Road Roughness Conditions / Road Survey



Big Data Analytics

3. Vehicle to Vehicle Communication: Advanced Warning



- Detailed driving behaviour of V1 / V2 / V3 stored at infrastructure 2
- Norm driving behaviour created over time
- V4 will be alerted when its patterns differ from norm

Thank you for your attention

chalernpol.saiprasert@nectec.or.th

www.nectec.or.th

www.nstda.or.th

