A car-borne radiation survey and data management system for wide-area and quick survey of gamma radiation

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NORM Survey and Analysis Laboratory (NSAL)

- NSAL has experience working with NORM and TENORM from various origins.

- Example of NORM Surveys and Activities:
  - Walkover survey and in-process inspection on on- and off-shore oil and gas production facility
  - Environmental remediation
    - Radium/radon measurement in soil, ground and surface water
    - Removal of radium from contaminated water
  - Terrestrial radiation measurement
    - Car-borne survey
    - Radiation contained in food stuff
Background Information

- Car-borne radiation survey is a great way to conduct wide-area measurement and can be performed regularly and economically.
- Currently, radiation monitoring in Thailand is performed at fixed stations (18 on-land, and 5 underwater).
- In emergency situation, local data may be necessary to assess the severity of the situation.
- Local data at different time is also useful to evaluate how various changes (due to human activities or nature) affect the radiation level in a specific area.
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Needs
A way to automatically collect data
A way to manage data for future analysis
Factors Considered

- Types of Data That We Want to Collect
  - Dose/Dose Rate/Spectrum/Count/Count Rate
  - Location
  - Time
  - Image/Video
  - Etc.

- Data size and how to manage
- Portability
- Expandability
- Connectivity
- Software needed/Open source?
- ...Cost?
System Diagram

Detector System

Detector

Portable Computer

GPS

Location and Time

Remote server

User

Internet

Video Recorder

Internet
Programmable single board computer such as Raspberry Pi or Arduino can ideally be used in place of the portable computer if no client-side control needed.
Client Side – Survey Node

- 5x5 NaI(Tl) from BICRON CORP. is selected for its fast data collection, but 1x1 and 3x3 detectors are also tested.
- SCA system from LUDLUM Measurements, Inc. is selected as it allows real-time control and data transfer via RS-232 without additional software.
- GPS receiver from GlobalSat is selected as it allows real-time data transfer without additional software.
Control of survey equipment can be performed and synchronized through a software interface which can be run on any OS that has Java VM support (such as Windows, Mac OS, and Linux).
Data Acquisition

**Import Mode**
- **Set Name**: Rayong
- **Set Description**: Survey around Rayong area
- **Acquire Date**: 17/5/2018
- **Acquire Person**: Mr. A
- **Upload Date**: 2018-05-26
- **Upload Person**: Mr. B

**Acquire Mode**
- **Detector Status**: Ready
- **GPS Status**: Ready
- **Validation Status**: Ready
- **Set Name**: Bangkok
- **Set Description**: Bangkok vicinity survey
- **Acquire Interval**: 30 sec
- **Acquire Person**: FP
- **Select Detector**: Ludium
- **Select GPS**: GlobalSat

Start Acquiring | Stop & Close
Data can be loaded on top of Google map and presented using different types of display.
Server Side – Database

- Data is stored both offline as raw files (text, image, video) and on a database management system installed either locally or remotely.
- MySQL, a relational database management system, is used in this work.
Client-Server Configurations

Two client-server configurations are currently possible

- Local connection – same computer acts as client and server at the same time.
- Remote connection – two computers connect remotely.* One acts as a client, the other as a server.

* Server can be on cloud.
Data Handling Test

Data handling capability of the software has been tested using data from previous car-borne survey [Chanyotha et al.]

Google Map can be displayed in both map and satellite modes which is useful in analysis. You can see how geological terrain and human structures around each area look like.
Comparative Test

Comparative test has been performed against a standard system (EMF-221, EMF Japan Co.). Although the standard system is MCA whereas the in-house system is SCA, the result shows the agreement between the two.
In Conclusion

- We have developed a radiation survey and data management system for car-borne gamma survey activity.
- The radiation survey performed comparatively well against the standard system.
- The data management system can store and recall data in an organized manner for future analysis.
The MySQL database by design is capable of handling concurrent multiple connections. So it is possible to process multiple survey and analysis nodes at once.

Further study has been planned to test the stability and limitation of the system.
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Finally, you are cordially invited to visit

- Our booth – for other research and activities
- Poster titled “Natural Radioactivity Concentration in Traditional Thai Herbal Medicine”

Thank you for your attention.