RFID-Based Cadastral Boundary Mark System (RCBMS)

Abdullah Hisam Omar  
Tajul Ariffin Musa  
Irvin Amri Musliman  
Siti Syukriah Khamdan  
Kamaludin Omar  
Universiti Teknologi Malaysia  
Email: abdullahhisham@utm.my  
Yip Kit Meng  
Enviro Land Services  
MALAYSIA

Commission No : 5

RCBMS : OVERVIEW

• Common navigation system rely mainly on satellite positioning (GPS/GNSS) for absolute position determination. Due to the main limitation of GPS, other positioning technologies should be integrated into the system design.

• Another alternative geo-location is to install RFID tags at specific landmarks and if the user passes by he can retrieve the tag information with its location.

• This would lead to the concept of active landmarks such as RFID-Based Cadastral Boundary Mark System (RCBMS).
The current boundary mark
- Made from concrete in the form of a cylindrical shape with a dimension of 70 mm in diameter and 600 mm long, with weight approximately 7 kg.
- Heavy to transport, brittle and does not carry any information on site.

Therefore,

The main aim of the RCBMS is to modernize the conventional boundary mark with lighter, robust, easy to locate and carry spatial and non-spatial cadastral information on site.

RCBMS : SYSTEM CRITERIA

- Able to acquire spatial and attributes data of cadastral boundary mark directly on-site.

- A low-cost system and minimize time to locate cadastral boundary mark and retrieval of information.

- Technology update to utilize National Digital Cadastral Database (NDCDB).

- A single system to manage cadastral boundary mark information.
RCBMS: THE CONCEPT

GPS navigate user to nearest RFID boundary mark.

User query information from database

Database then provides cadastral information to the user.

USER DISPLAY

RCBMS: THE APPROACH

TECHNOLOGY
- Boundary Mark Material
- RFID
- GPS
- Others?

SPATIAL & NON-SPATIAL DATA
- Mapping
  - Attribute
  - Spatial
- Static/Dynamic Database
- NDCDB

SYSTEM DEVELOPMENT
Sub-system A: Boundary Mark, Sensor, Integration.
Sub-system B: Database Development.
Sub-system C: Application Design

USER’S
- User needs & requirements.
- Optimum Management.
- Human Resource Development.
- Cost effective.
Musliman et al proposed to use the cell-based concept in the telecommunication industry – **Global System for Mobile Communication** (GSM) which its network is made up of geographic areas.
RCBMS: CELL-BASED CONCEPT

RCBMS: MOBILE DATABASE

MySQL database used to
- support the server side tasks and scripting.
- store RFID information of boundary marks & UPI key.

User will send request to the server and will be processed to perform SQL.

Results are the detail information of RFID-tag cadastral lot with its associated boundary mark and attribute information.
PROTOTYPE COMPONENTS OF RCBMS

PROTOTYPE 1:
RCBMS MODERN BOUNDARY MARK

PROTOTYPE 2:
RCBMS APPLICATION

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PROTOTYPE 1: MODERN BOUNDARY MARK

Preparation of Materials and Mould
Casting Process
Removing Cast Mould
Ready for Curing Process

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PROTOTYPE 1: RCBMS MODERN
BOUNDARY MARK

Palm Oil Fuel Ash (POFA)
Palm Fuel Ash (PFA)
Bottom Ash
Lime
Gypsum
SP

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PROTOTYPE 1: RCBMS MODERN
BOUNDARY MARK


<table>
<thead>
<tr>
<th>Type of Cement</th>
<th>Type of Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>POFA + PFA</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Boundary Mark</th>
<th>Boundary Mark</th>
<th>Boundary Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member</td>
<td>Date of Cast</td>
<td>Date of Test</td>
<td>Period of Curing (day)</td>
</tr>
<tr>
<td>-------</td>
<td>--------------</td>
<td>--------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>A</td>
<td>25/3/2013</td>
<td>16/5/2013</td>
<td>52</td>
</tr>
<tr>
<td>B</td>
<td>25/3/2013</td>
<td>16/5/2013</td>
<td>52</td>
</tr>
<tr>
<td>C</td>
<td>25/3/2013</td>
<td>16/5/2013</td>
<td>52</td>
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</tbody>
</table>

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RCBMS application were developed within RFID reader by using C# Microsoft Visual Studio programming language.

The source codes of two RCBMS applications for integration of spatial-attribute cadastral data and user RFID interface were coded in the RFID reader.
THE NEXT STEP

To integrate the GPS sensor with the RCBMS.

To improve the crushing load and strength of the cadastral boundary mark in Prototype 1.

To classify the cadastral lots in that certain area, e.g. there are different numbers of cadastral lots in rural and urban areas.

To quantify the benefits of RCBMS.

To apply for other survey control monument.

EXPECTED OUTPUT

- New design of boundary mark.
- Obtaining cadastral information on site.

ECONOMIC

- Low in cost system.
- Fast data searching.

INFRASTRUCTURAL

- New equipment for CCI.
- New/improved facility for CCI.
ACKNOWLEDGEMENT

• Financial assistance from Malaysian Peninsula Land Surveyors Board (LJT)

Thank you for your attention!

Faculty of Geoinformation & Real Estate
Universiti Teknologi Malaysia
abdullahhisham@utm.my