March 2006
Issue 4, Second period

IAARC Newsletter

Editor's message

In this Issue:

Dear reader,

It is again a pleasure to contact you, in this new issue of the IAARC Newsletter. In the last months, the IAARC Association has continued its activity and, after the successful ISARC in Ferrara (Italy), the new annual ISARC is coming very fast.

Thanks to the contribution of two of the most active members of the Association you can enjoy very interesting articles in this issue.

Professor Tai Sik Lee and his collaborators present us an introduction to a portal that results very efficient giving technical support in Construction Industries for Knowledge Documents Management (KDM).

In the other article of this issue, Professor Ronie Navon (Tucker-Hasegawa Award 2004) presents a review of Automated Measurements Tools in the Construction Industry that will result vital for future applications where automation and robotics will be present.

In a short period of time, we will also edit a Special Issue of the IAARC newsletter with an extraordinary contribution of Professor Thomas Bock, the current President of the IAARC.

In this Special Issue Professor Bock will present a review of the last developments and Innovations in Construction by means of Automation and Robotics.

More interesting topics will be cover in the following issues. I will thank your contribution, sending new ideas for topics and descriptions of research and development works in our field.

Finally, I will like to remember all of you that the next annual ISARC is coming very fast and in the next October we will have our annual meeting: the 23rd ISARC in Tokyo, Japan. Once again the work of the organizers has been really hard and the topics are really interesting.

See you in Japan!

Ernesto Gambao

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The ISARC'2005 in Ferrara (Italy)

Organisation

Thanks to the effort of Professor Fiorenzo Malaguti and his team, the 22st International Symposium on Automation and Robotics in Construction (ISARC 2005) was held in Ferrara, Italy. The participation was very high, with more than 80 selected papers.

The venue was also really impressive in the Faculty of Architecture of Ferrara University, in the city centre.

The participants could enjoy Ferrara, City of art, seat of an important court of the Renaissance, and included in the UNESCO's list of the World Heritages. Ferrara's downtown is enclosed in the city walls, about 2km from side to side, and the ISARC participant could also visit it by bike.

Introduction of Knowledge Documents Management (KDM) Portal for Technical Support in Construction Industries

By Tai Sik Lee[1], Dong Wook Lee[2], Young Hyun Kim[3], Ja Kyung

In developing KMS, the three main problems are as follows:

- How to find and manage the scattered knowledge in the organization
- How to use the knowledge better than through the legacy system
- How to devise an approach for the enhancement of the system

The new KDM (Knowledge Document Management) Portal System developed at e-Construction Lab., Hanyang University has overcome the limitations of existing KMS by focusing on Technical document management.

CHARACTERISTICS AND FUNCTION OF THE KDM PORTAL

The KDM portal has various access methods. The KDM explorer and the file browser can manage personal files; and the viewer of text in files for the technical data and the advanced viewer can make flexible knowledge management possible. The portal also has the full-text search function with highlighting support.

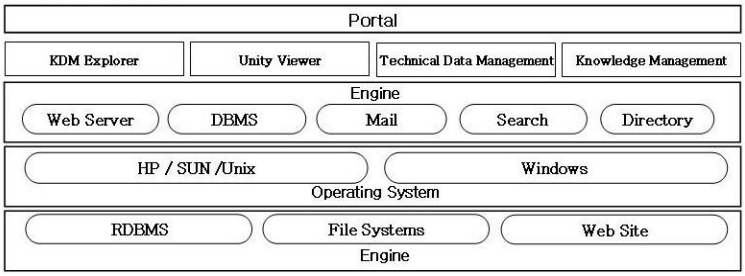
- Process

The process of the KDM portal enhanced the storage of technical data by project in technical information, management/searching, and the output of drawings.

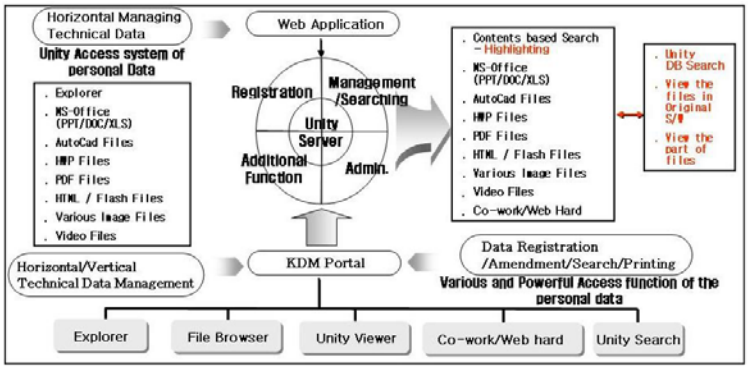
The KDM portal is designed for the information and the system in a company to be accessible at a single point. Especially the browsing, sharing, and knowledge-searching functions can be a tool for facilitating work between persons or departments. It can improve the ability of competition against other companies by maximizing the use of technical information accumulated in the company.

- Brower Function

The browser function of KDM can be applied for personal information management systems through a rapid search for all the personal and organizational documents. It is then possible to improve the progress of business, accumulation of know-how, and business processes.

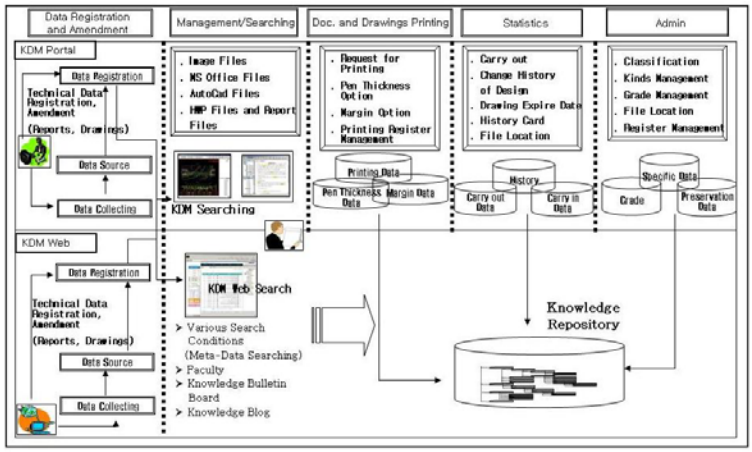


Architecture of KDM Portal

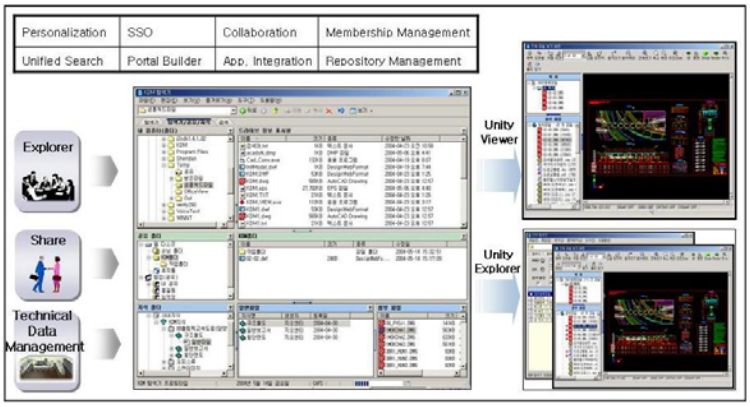


- Future Intention Structure – JAVA BASE Component based Open Architecture / XML
- Independence of Platform – Transplantation Convenience (Unix, NT)
- Softness of User Management – Easy Accessibility to KDM Portal
- Expansion – Convenience of System Integration
- DBMS – Supporting RDBMS like Oracle, MS SQL2000, Sybase, etc.

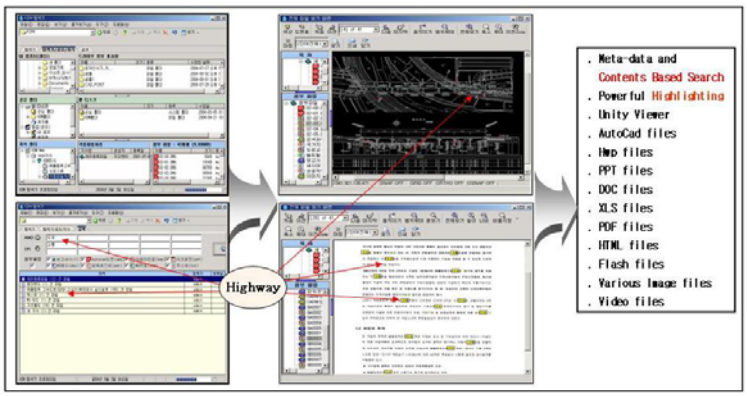
Characteristic of KDM Portal



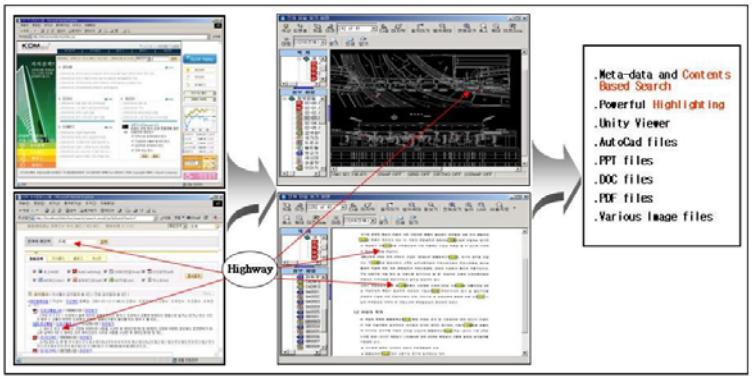
Process of KDM Portal



Portal Function of KDM



Portal Searching Function of KDM



Web Searching Function of KDM

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- Searching Function

The KDM searching function integrates the scattered information in/out of the head office and provides a fast search system for business. Most important factor in the function is co-relations with the other systems.

And it is designed for the information and system in a company to access at a single point, providing convenience in system extension and integration. This allows for the effective management of the information system. The Web searching function enables fast searches anywhere and anytime by integrating the knowledge materials in/out of the main office. This distinguished system may improve the business process, meanwhile maximizing the use of information.

EXPECTATION AND FURTHER STUDY OF KDM PORTAL

The current legacy systems have various worthwhile functions, but it should be capable of managing extensive amounts of technical information by project and have a quick-search function. KDM Portal has aforementioned enhanced functions, as well as storing/managing technical information, searching, a systematic classification structure, managing personal information, and printing. The following is to be expected with the proposed system.

- Low-cost system for small and medium-sized construction companies,
- Development of a technical information system corresponding with the legacy system architecture,
- Improvement of business effectiveness and productivity,
- Enhancement of Information technological bases and increase in knowledge assets by the accumulation of technical information and security.

And we also suggest further study tasks as follows.

- Training construction experts for recognition on value-sharing by KMS,
- Establishment of a standardized ERD(Entity Relationship Diagram) classification system for knowledge sharing throughout the entire construction industry,
- Enhancement of accessibility in technical information by developing the KMS engine (searching/Web) and publicly releasing the engine,
- Expanding the system by business characteristics from the standardized knowledge engine.

Automated Performance Measurement

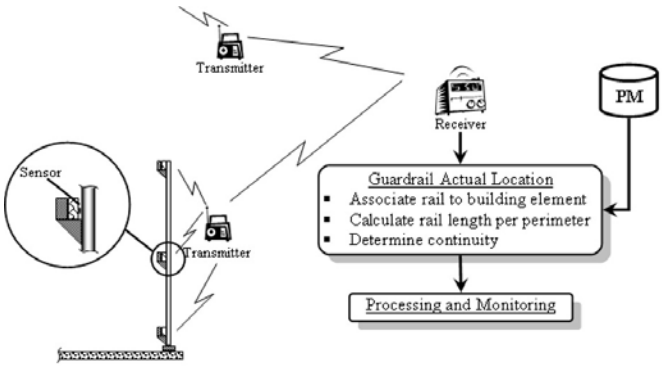
By Ronie Navon[1]

Industrial managers find continuous, real-time and detailed, performance measurement, an indispensable tool, thus permitting corrective measures to be taken while the work is still in progress. Taking into account that the rate of rework in construction exceeds 10% and the waste of resources (especially in labor) surpasses 20%, such tools are needed in the construction industry too. Manual measurement is labor intensive (in some cases up to 50% of field supervisory personnel time is spent recording and analyzing field data), is error prone and is inefficient in an industry where a typical activity takes days, while measuring the actual performance and analyzing it normally takes weeks.

Having a real-time up-to-date picture of what goes on in the site is important not only for conventional construction, but is vital for a future construction site, where humans and robots operate simultaneously. Such knowledge is needed to maintain competitiveness and to ensure high quality and safety.

Researchers at the Construction Automation Laboratory of the Technion – Israel Institute of Technology have been developing the following performance measurement tools[2]:

- Labor productivity – the principle here is that the location of workers as function of time is measured constantly and converted into productivity. The initial experiments resulted in encouraging results, but as we dig deeper into it we find more challenging questions. One of the key problems now is the lack of a suitable off-the-shelf tool capable of measuring the location of workers both inside and outside a building. The figure on the right shows a worker with a GPS as a location measurement device during one of the field experiments. We will, hopefully, report progress in the next ISARC in Tokyo.
- Earthmoving equipment productivity. The same principles served as the basis for this model, which was implemented in a prototype system for controlling earthmoving operations in road construction. Here, too, the results of the initial field experiments were encouraging, but the work done during the measurement period had to be determined manually. Currently we are investigating algorithms capable of determining the latter automatically based on the locations measured during a given time period. The results of this stage will also be reported in Tokyo.



1 For further details please contact Ronie Navon at ronie@technion.ac.il

2 Presented in a keynote lecture in the last ISARC in Ferrara: Navon, R. (2005). "An Overview of Automated Project Performance Control Research at the Technion." Proceedings of the Twenty Second International Symposium on Automation and Robotics in Construction, Ferrara. Italy: 25-38.

- Materials management and control. The model initiates materials purchasing, follows up the status of purchase orders, records materials data as they arrive to the site and their movement around the site, makes recommendations, generates reports and issues warnings. The model was implemented, tested and evaluated in an ongoing building construction project. The onsite experiments confirmed that automated materials management and control are feasible, resulting in real benefits, such as time savings, and availability of up-to-date and accurate information regarding stocks of materials on site.

- Control of Preventive Measures Against Falls from Heights. The objective of our research was to automate fall prevention procedures. An automated model that identifies the dangerous activities in the project's schedule was developed. It also defines the areas in the building where these hazards appear, proposes protective measures and activities and integrates the latter into the schedule. Additionally, it constantly compares the planned guardrails (location and time) and the ones actually used on site. The model provides textual and graphical reports and warns when guardrails are missing, are incomplete, or have been partially removed. The model was implemented, tested in an ongoing project.
- Daily Site Report Control Tool. The daily site report (DSR) is one of the most important records during construction – it holds a vast amount of detailed, accurate and up-to-date data, logged on a daily basis. Unfortunately, such a valuable source of data is not used for the management and control of the ongoing project – it is mainly used for litigation – claims and disputes and sometimes for billing purposes. We are developing a computerized DSR which will serve as a data collection tool to build a database that contains data regarding the actual performance of the project. These data will be processed, by algorithms developed for this purpose, to generate managerial information regarding the actual events occurring in the project. This information will be used to control the project in real-time on a daily basis and generate warnings when deviations occur. Additionally, because the database includes variables such as the number of workers for each trade, the materials arriving to the site (type, quantity, date), the user will be able to easily analyze the reasons for the deviation and, thus, be much more informed to take corrective measures.

The ISARC'2006 in Tokio

The 23rd ISARC, "International Symposium on Automation and Robotics in Construction 2006 (ISARC 2006)" will be held in Tokyo, from October 3 to 5, 2006.

ISARC 2006 has set "Robot Technology (RT) and Information Technology (IT) Guiding the Construction Industry" as its main topic, to promote modernization of building production systems and technical innovations of the construction robot field in construction industries in the world.

The main topics of the symposium will be:
1. Future Outlook
Robot and IT need at construction site / Environment of construction robot development / Advanced usage of design and construction information /Robotized construction and design issue /Planning and management technology for construction robot

2. Planning and Management
Economics, quality and productivity of robotic construction /Advanced method / IT / Computerized construction /Knowledge engineering and AI usage /Virtual reality /Logistics and CALS

3. Robot Technology
Sensor / Image processing / Measurement and Diagnostics /End effector /Mobility / Control /Human interface /Teaching /Information system

4. New Area and Field for IT and robot technology
Environment / Disaster prevention / Safety recovery /Maintenance and repair /Rapid construction

5. Applications
Foundation and ground work /Tunneling / Bridge construction /Dam construction /Offshore work / Building construction system /Assembly, finishing, and service work /Transportation and lifting /Measurement and Inspection /Unmanned and remote construction /Demolition

The venue of the project will be the International Conference Center (Ibuka Memorial Hall at Center Scholarly Information) at the Waseda University Campus.

IAARC
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ISARC 2004/2005 proceedings CD on-line

The proceedings CD from the 21st ISARC, held in Juju Island during September 21-25 2004 and 22nd ISARC, held in Ferrara, Italy, during September 11-14 2005, have finally been made browsable on-line. More than 220 papers from more than 21 countries are available at http://www.iaarc.org/