Development of CYPRUS+ with Fracture information, Groundwater chemistry contents and PID modules

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1. Introduction

Cyprus is the CYber R&D Platform for a Radwaste disposal in a Underground System, Developed by KAERI since 2000. An automated quality assurance system designed to ensure all project members follow the compulsory QA procedures from the first to the last stage of a TSPA. Cyprus is focused on how documents are written and stored. For these reasons Cyprus is made using PHP web programming language which is easy to handle and available to distribute freely. So a researcher can use this program anywhere, anytime.

2. Developing Cyprus+

2.1 Features of Cyprus

Cyprus is comprised of three parts. First is PAID system which is used to input, store and classify the data for radio waste disposal safety performance assessment. Second part is FEAS module which can develop the radio waste disposal scenario related with FEP (Features, Events and Processes). The last is a QA system based of T2R3 (Transparency, Traceability, Reproducibility, Retrievability, Review) quality guaranteed rule. Cyprus is a project based system and its information is secured through different levels of user rights.

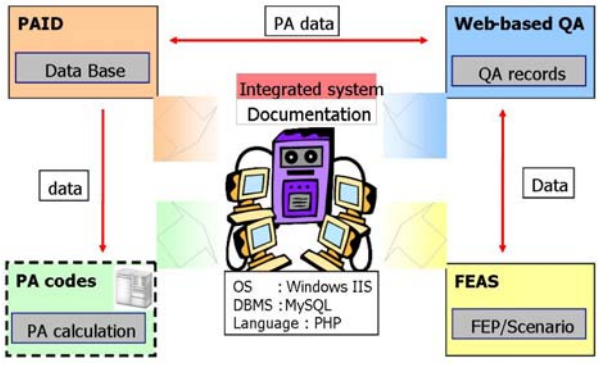

Fig. 1. A conceptual diagram of Cyprus comprised with three parts with web database system.

2.2 Developing the additional modules

Although the existing Cyprus has excellent functions for managing every kind of data, it is not enough to satisfy a demand for showing the fracture information, groundwater chemistry contents and diagram to express the influences between processes. So in this research we have develop three modules which are named FI (Fracture information), GCC (Groundwater Chemistry Contents) and PID (Process Influence Diagram).

2.3 Fracture information

Research for a radio nuclide transport is important in disposal site. When a radio nuclide release into the underground from disposal site, fractures on the rock are a major route of a nuclide transport. If we predict the route of nuclide, we should know how fractures are shaped and how many there are in the rock. So a module which can store fracture information and show the diagram of every data was developed in this research. The fracture information has lots of data: fracture set number, dip direction, dip angle, fracture size and location. The FI (fracture information) module in Fig.2 shows every data on the three diagrams at a glance.

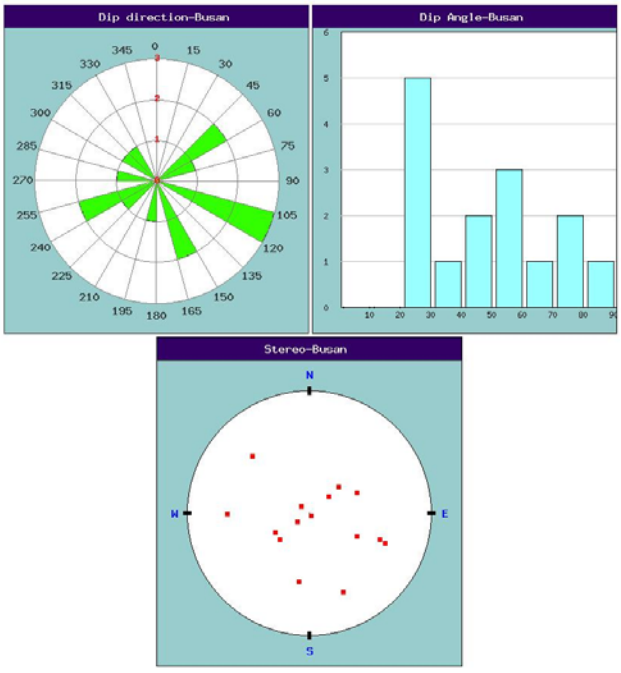

Fig. 2. Diagram of FI (fracture information) module: dip direction, dip angle and distribution of certain area.

2.4 Groundwater chemistry content

Radio nuclide transport is released by groundwater. In the water certain colloid and ion is important role to

transport nuclide. So being aware of groundwater chemistry content (GCC) is also important. Fig.3 shows ten major ions in a groundwater. Include these data, another minor data are also stored in Cyprus system.

FI and GCC modules are coded by GD graphic library: web programming language. This library is open source code and can use with any other programming language. So it is available to use free and easy.

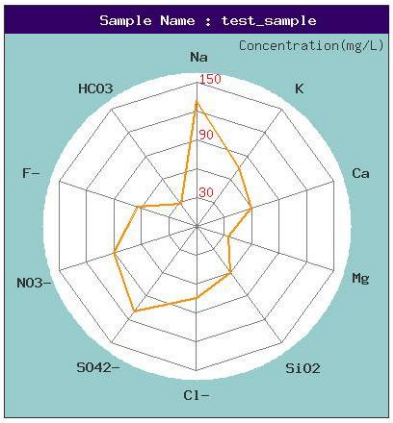

Fig. 3. Diagram of GCC (groundwater chemistry content) with ten major ions in groundwater.

2.5 Process influence diagram

Existing Cyprus has the RES (Rock Engineering System) method which uses a matrix. This makes it easy to express major influences of a scenario but difficult to find out the detail relationship between FEPs. So we need to make another form which can find the influential relationships between each process. Fig.4 shows PID (process influence diagram) using Graphviz which is a kind of module representing node relationship. It is also an open source code. So this module can be integrated with existing Cyprus.

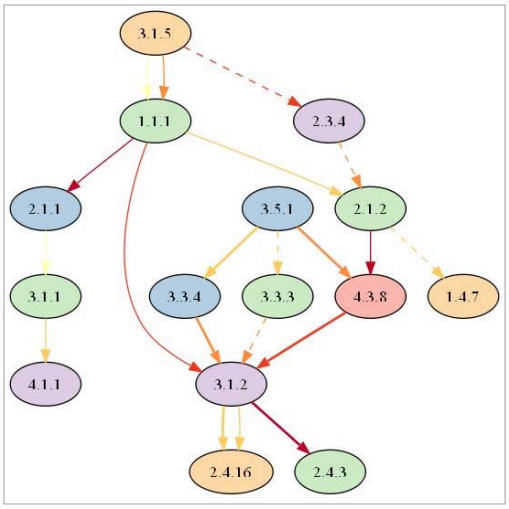

Fig. 4. Diagram of PID (process influence diagram) using Graphviz

3. Conclusions

KAERI has developed Cyprus over several years. After the first version was developed in 2006, the next version Cyprus+ is developing until now which includes three modules. These modules enhance the existing functions and improve Cyprus' abilities. In the future Cyprus+ with these three modules will be shaped like Fig.5. This research will contribute to analyzing the stored data and enhance the reliability for a safety performance assessment.

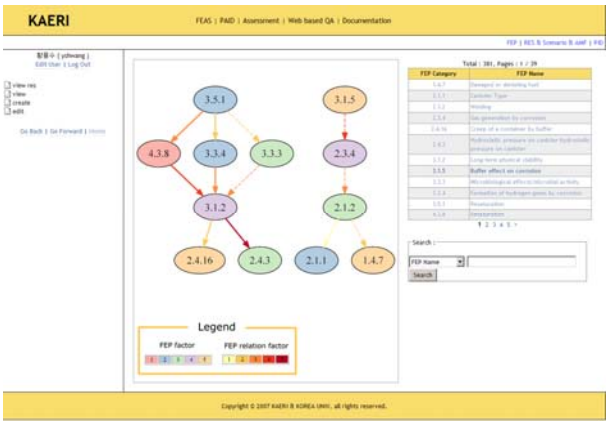

Fig. 5. Illustration of Cyprus+ integrated with PID module.

Acknowledgement

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