A Study and Implementation of Algorithm for Automatic ECT Result Comparison

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1. Introduction

Automatic ECT Result Comparison Algorithm was developed and implemented with computer language to remove the human error in manual comparison with many data. The structures of two ECT Program (Eddynet and ECT-IDS) that have unique file structure were analyzed to open file and upload data in PC memory. Comparison algorithm was defined graphically for easy PC programming language conversion. Automatic Result Program was programmed with C# language that is suitable for future code management and has object-oriented programming structure and fast development potential. Automatic Result Program has MS Excel file exporting function that is useful to use external S/W for additional analysis and intuitive result visualization function with color mapping in user-friendly fashion that helps analyze efficiently.

2. Definition of Compared Variance

For Automatic ECT Result Comparison Algorithm, definition of compared variance is needed. Basic result of ECT report file consists of position of ECT tube with ROW/Columns number, voltage of indication, degree that shows phase of indication, detecting channel, location of indication including offset, indication type, raw ECT data file name and directory. In these variables, we selected location of indication, offset and PCT value like type of indication as compared variances.

3. Specification of Comparison S/W

Table 1 shows the specification of Automatic ECT Result Comparison S/W. Automatic ECT Result Comparison S/W has several functions like loading both Eddynet and ECT-IDS report file. C# language was used to adapt to other platform like Linux OS for future extension. For Exporting Excel file of comparison result, external dll(dynamic link library) module like Excel.Interop.dll was needed. GUI was designed in visual studio 2010. Additionally GDI(Graphic Device Interface) was needed to manipulate the color of Datagrid cell.

Table 1. Specification of Automatic ECT Result Comparison S/W

Item	Content
Major Function	•Load Eddynet/ECT-IDS report data
	•Automatic Comparison
	•Comparison Result Visualization
	•Export Excel file
Operating PC	IBM-PC Compatible
Operating System	Windows-XP Windows 7
Development Environment	MS visual studio 2010
Development Language	C#
External Component	MS dotnet framework 4.0 Excel.Interop.dll

4. Analyzing Report Data File Structure

After analyzing file structure, we found that not only Eddynet but also ECT-IDS were configured with text format. But detail structure was different.

4.1 File structure of Eddynet report

In case of Eddynet, Structure of Eddynet has some pattern to configure the columns and rows to show the manual estimation results. But there is no header part that includes information of report number. So, file streaming was needed until end of file simultaneously counting the current number of report. The element of Eddynet report file has specific position which has index. Therefore, additional calculation is needed to merge some group with each character including point or separator. In other words, each character in Eddynet report has specific position and we can merge several characters into a meaningful word. Figure 1 shows the Eddynet report file.
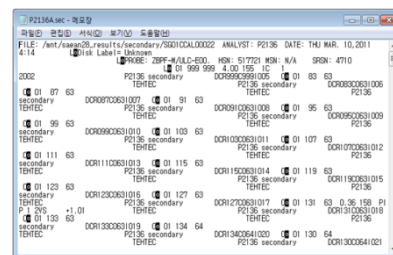

Fig 1. Eddynet report file

4.2 File structure of ECT-IDS report

In case of ECT-IDS, file structure of ECT-IDS report is XML(Extended Mark-up Language) that is similar with HTML(Hyper Text Mark-up Language), but user can define unique structure like header, variable indication, etc in file, also be easy to load in PC memory because header part that includes information of report like number of columns and rows was divided from result contents part. Unlike Eddynet file streaming function, C# language supports the XML streaming

function with easy file opening and loading data in PC memory without additional character control. Figure 2 shows the ECT-IDS report file.
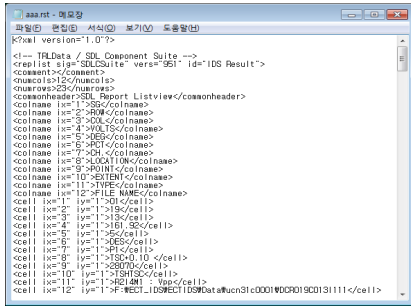

Fig 2. ECT-IDS report file

Table 2. Structure of Eddynet report file

5. Comparison Algorithm and S/W

5.1 Comparison Algorithm

Comparison algorithm is configured with four steps.
First step is to read report file, arrange characters and make words with specific order, finally, put the data into memory cell. Second and Third step is to compare the value of memory cell with assigning flag after completing comparison. Final step is to change the color of cell in Datagrid GUI for intuitive comparison result. Figure 3 shows the comparison algorithm. After finding value of Rows/Columns in each report file, internally 4 steps is executed to compare the variance like existence, similarity of landmark, user defined range and indication.

After completing comparison, every row in both report data is assigned with specific flag like Both Call, Both Discrepancy, Overcall in IDS, Miss in Eddynet. After that, color definition function changes the cell color with previous flag step.
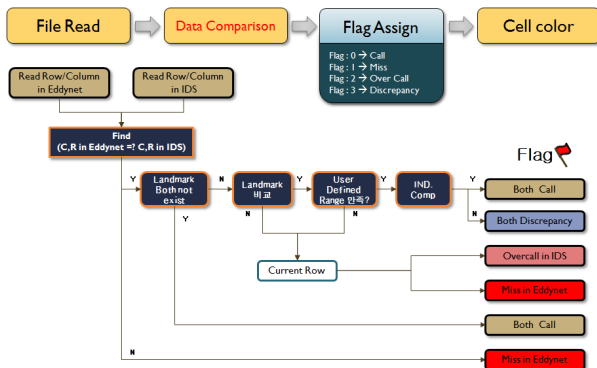

Fig 3. Comparison Algorithm

5.2 Comparison S/W

Automatic ECT Result Comparison S/W that was programmed with C# language for east GUI designing and efficient code management later can be operated on Windows XP and Windows 7. Figure 4 shows the specification of Automatic ECT Result Comparison S/W. Comparison result was showed like Figure 5. Color of each row is assigned with result flag, after completing calculation. User can conveniently review the result with cell color. In the main menu of S/W, user can export result to Excel file. Color flag also appear in Excel file that can support variable sorting or managing function.
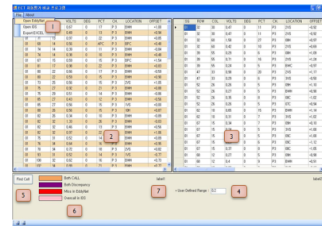

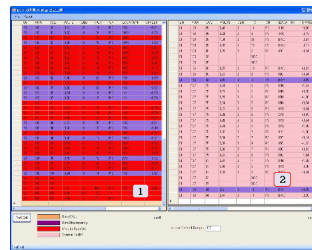Fig 4. Automatic ECT Result Comparison S/W GUI
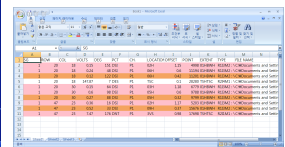

Fig 5. Result of Comparison   Fig 6. Exporting Excel file

6. Conclusion

Removing human error as comparing many ECT data is unavoidable without automatic method. For this reason, Automatic comparison S/W was essentially needed. This S/W is being used during in-service inspection period, modified for searching errors and revision via field application. Additional function like comparison between primary analyzer's result and secondary analyzer's with same ECT program will be also implemented by S/W updating.

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