

A Novel Report Generation System for Medical Applications

Kaya Kuru

Abstract - There has been an increasing demand for high quality medical data that are in a standard electronic format and easily shared. Although a great amount of effort has been invested to ease the process, an effective solution has yet to be found. In this study, we first discuss necessary features of an effective data collection and reporting system, and then reveal the conceptual view of a novel method that aims to encompass these features. We also present the design and implementation details of a Web-based prototype.

| definition | description of variables | examples |
|---|---|--|
| data field <var,type,val,opts> | var :the name of the data field type:the type of the variable val :the initial value of the variable opts:a list of options(name1,val1;...) | patient sex nominal(M,F) male male,M;female,F |
| data entry <label,vars,defs,triggers> | label :a unique identifier vars :a set of variable definitions, defs :a set of data DRVDs[type; lang; def(label; var; vals; opts)], triggers:a pair of the form [cond(label; var)],[action], | relief normal,not normal details are in the paragraphs [relief ==”not normal”], [trigger DRVD] |
| report <E,M,triggers> | E :a set of consistent data entries M :an ordered list of data entry identifiers triggers:a set of report-wide triggers | all data entries main data entries(initial skeleton) triggers |

TABLE 1: The formulas of definitions.

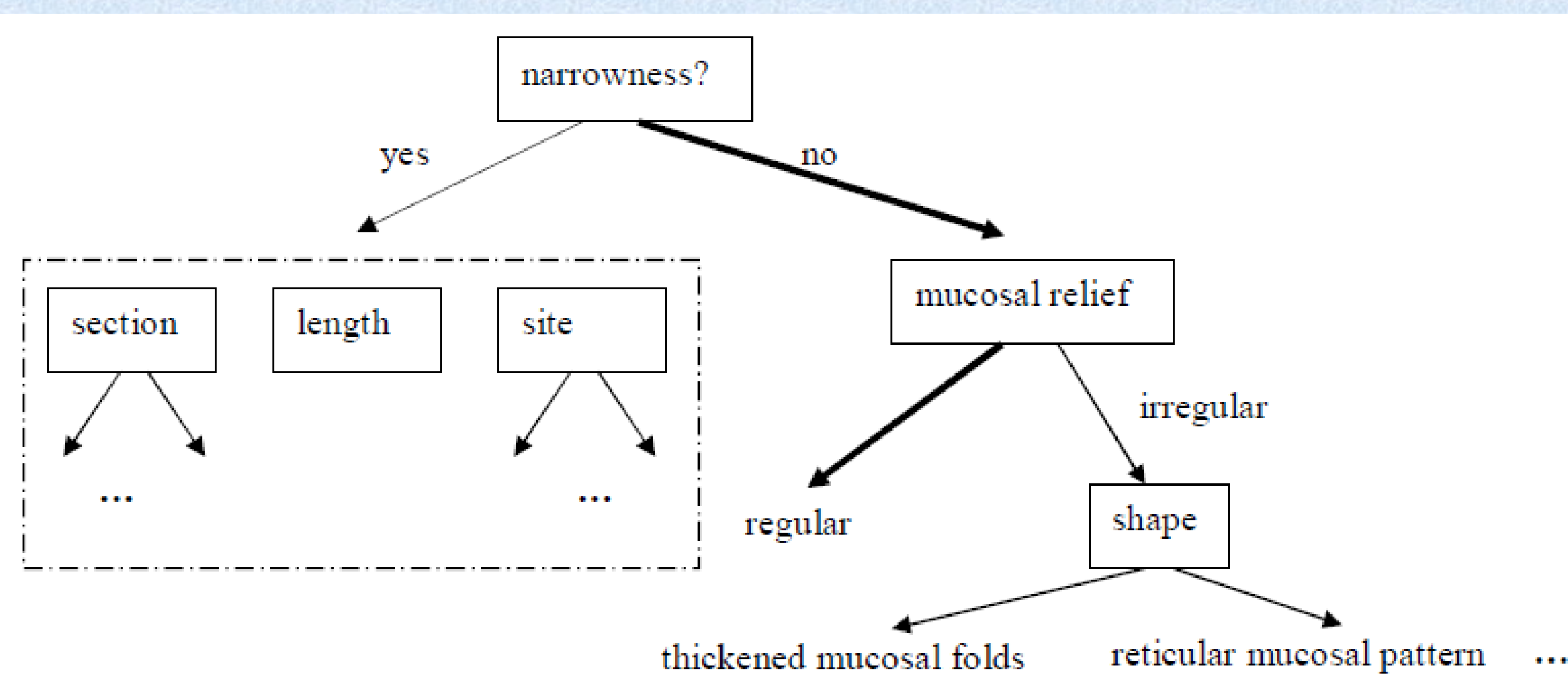


Fig. 1. The hierarchical structure. Boxes correspond to data entries and line labels indicate possible answers. The dashed box groups a set of data entries that are activated when there is narrowness. The normal values are shown with thick edges.

1 THE SISDS METHOD AND THE DATA SET

The general elements of formal specification of SISDS are summarized in Table 1. Reducing the cognitive overload is of utmost importance in medical reporting. Let us consider a typical esophagus radiology report which would, among other things, contain observations about the shape of the mucosal relief, the section, length and the site of the narrowness of the esophagus etc. When entering data for a particular case, only a subset of this information may actually be relevant. For example, one of the questions to be answered in this report would be the following: “Is there any narrowness without a clear expansion in the esophagus during the transition of the contrast media?”. Usually, the answer to this question is no, and in this case the mucosal relief should be entered, which can be either regular or irregular; if the mucosal relief is irregular then the shape of the irregularity should also be specified; otherwise, this information is not required. In case there is a narrowness that is the answer is yes, mucosal relief is not important and a completely different set of information should be entered including and depending on the properties of the narrowness, such as its section, length and site. Note that, this inherently leads to a nested and hierarchical structure as depicted in Figure 1, in which data entered at a certain point determines the information flow, and consequently, the related data that should be entered: note that this may lead to a combinational expansion. The interrelation of layers and the interaction of the user is presented in Figures 2 and 3. The architecture of the Web-based prototype is presented in Figure 4. The solution that we offer is to use inline editing, that is to present the report in a single view but allow the users to directly manipulate the data on the screen simply by clicking on data fields which are displayed as hyperlinks (Figure 5). The predefined nominal values are displayed for data fields when the user clicks any hyperlink, such as to enter the narrowness as “there is” or “there isn’t”; A text entry or numeric data entry field is displayed if there isn’t any predefined nominal value as “the length of the narrow segment” entered as 2 cm. As the user changes the values of variables, the contents of the report is also rearranged automatically according to predefined trigger conditions.

2 CONCLUSION AND DISCUSSION

In this study we propose a new methodology which adopts a systematic approach to improve medical processes by reducing variability and minimizing errors. The interactivity with the user allows information to be captured at the point of care and eliminate the need for a transcriptionist or auxiliary procedures to write reports. it also provides (i) a high degree of timeliness and accuracy, reducing errors, (ii) multifunctional capabilities such as drawing the attention of practitioner to important sections of the report, alerting him about a diagnosis or giving advises at the time of entry, and (iii) an easy way for domain experts to define reports in a textual form without extensive computer knowledge.

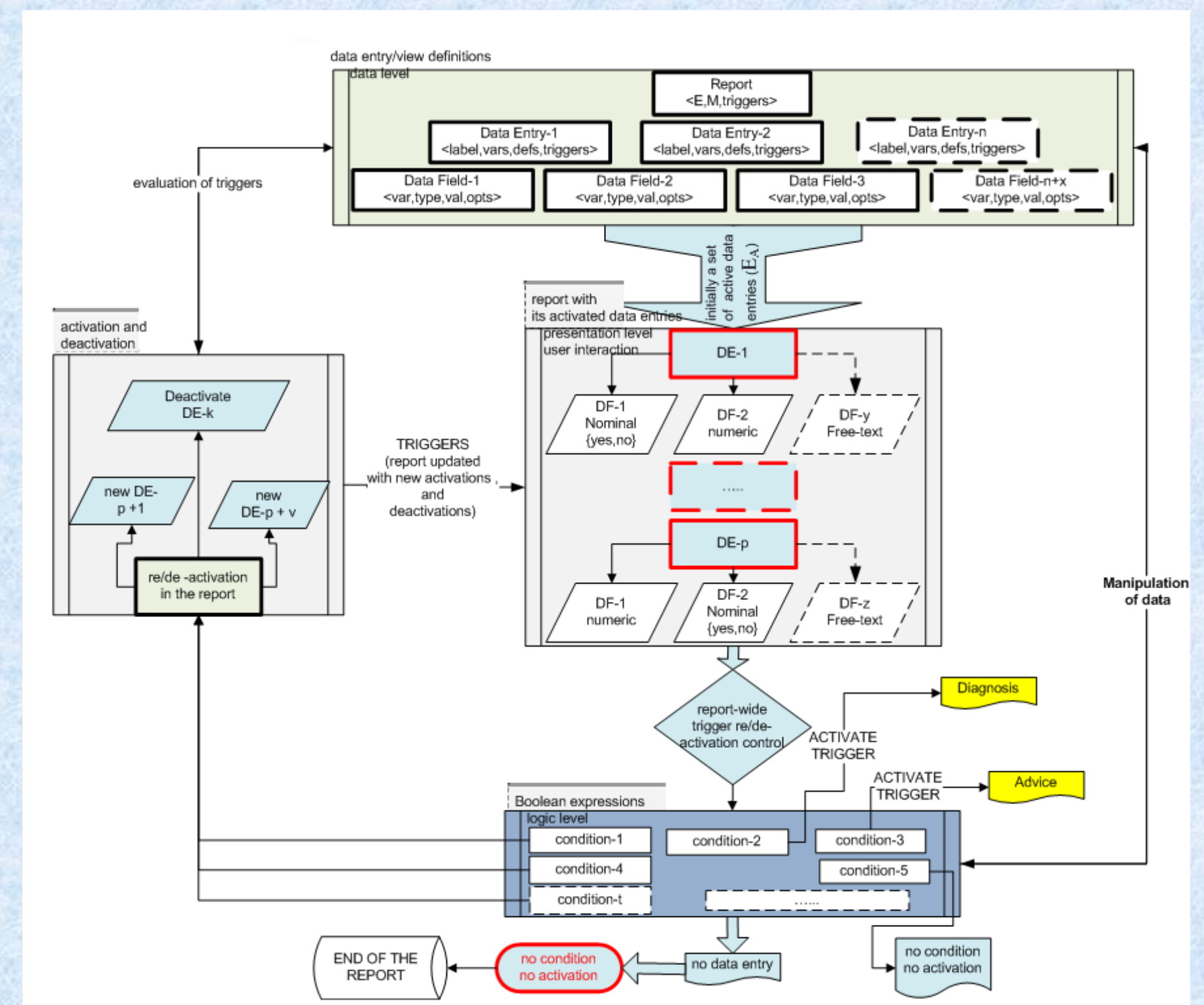


Fig. 2. The interrelation among the layers of data, logic and presentation, and the user.

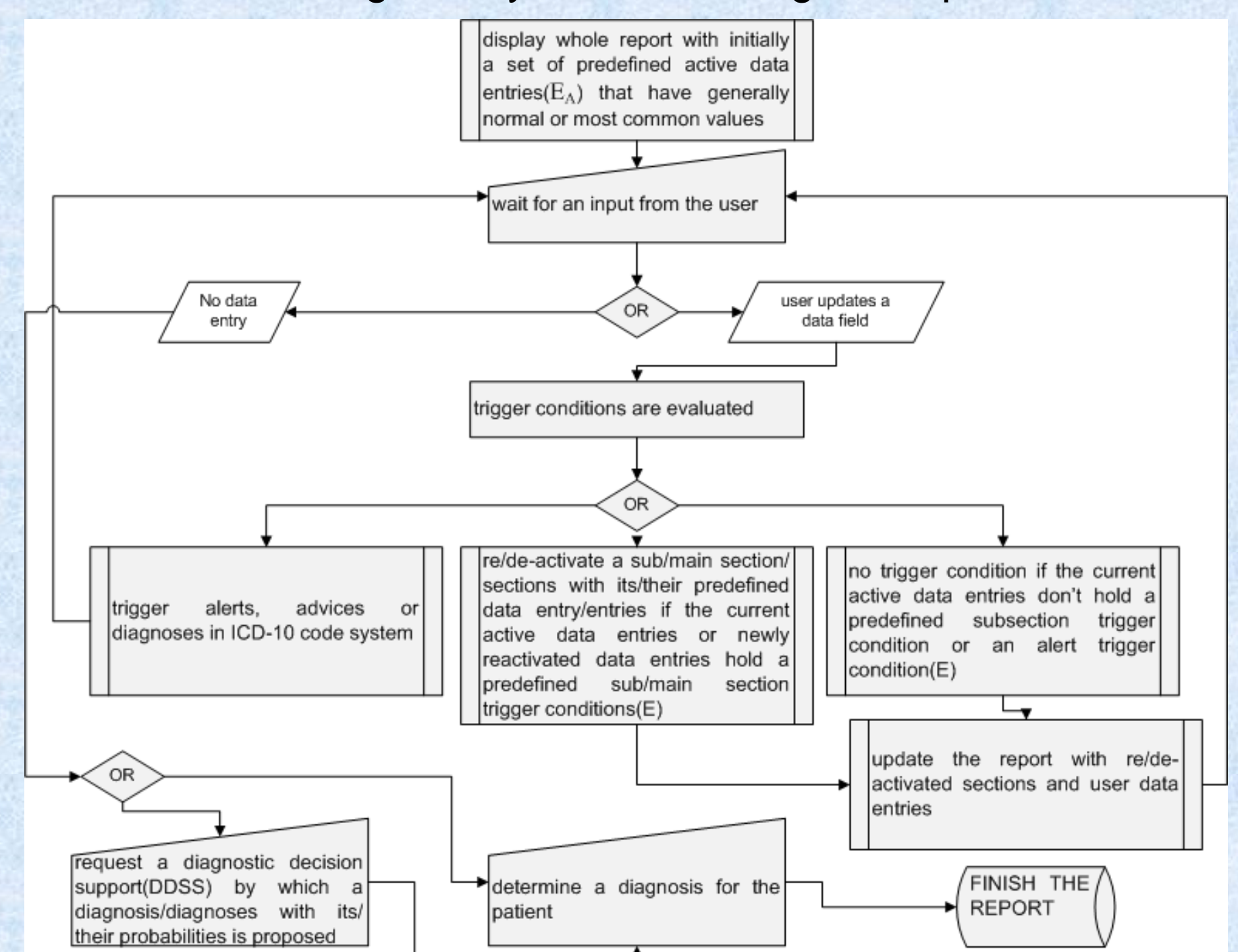


Fig. 3. The interaction of the user.

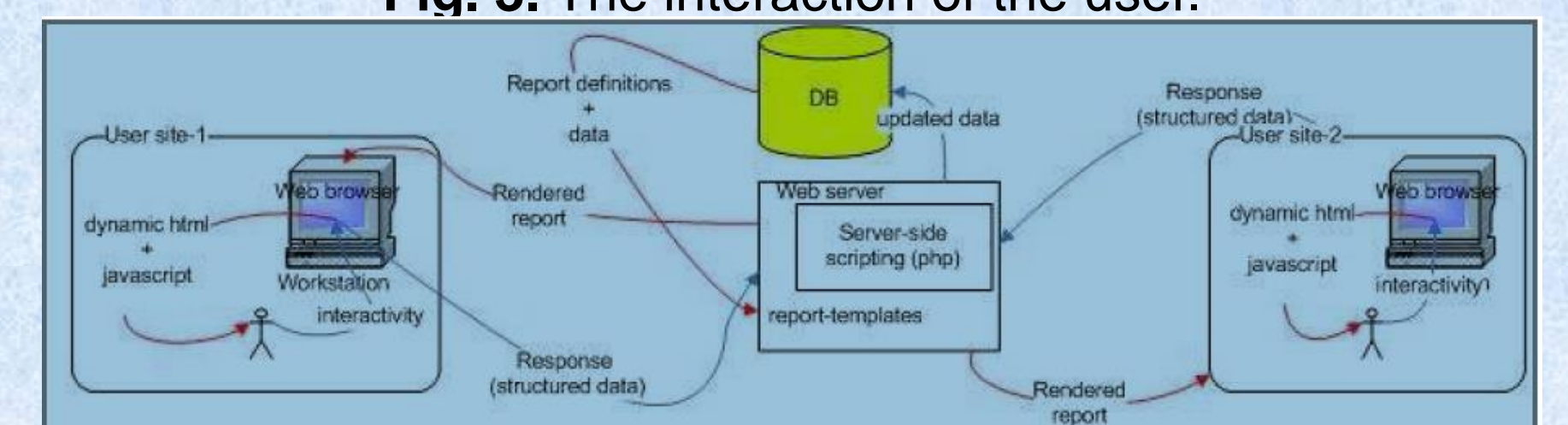


Fig. 4. The Web-based prototype.

Oesophagus
There isn't narrowness without a clear expansion in oesophagus during the transition of the contrast substance. The mucosal topography is not normal. The topography which is not normal in oesophagus is in the shape of reticular mucosal pattern.

Oesophagus
There isn't narrowness without a clear expansion in oesophagus during the transition of the contrast substance. The mucosal topography is not normal. The topography which is not normal in the shape of reticular mucosal pattern.

Oesophagus
There is narrowness without a clear expansion in oesophagus during the transition of the contrast substance. The section in which there isn't a clear expansion during the transition of the contrast substance is proximal 1/3 oesophagus. The length of the narrow segment is cm. The settlement of the narrow segment is symmetrical. The narrow oesophagus segment is cm mm inch.

Fig. 5. Inline data entry in free-text format. (top) Initial state. Abnormal values are highlighted in red, and the field yet to be entered has a gray background. (middle) When the user clicks on the link inline editing is activated. (bottom) The new value “There is” triggers another set of data entries.

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