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Knowledge Based Expert System for Symptomatic Automated Healthcare

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Abstract: Computer revolution is being implemented in each field, each system. In which real world experts are now switching to the computer and its expertise for reducing time, space tradeoff and take a lot of benefits in their fields. On the other hand computer scientists are exploring the things, which are not implemented by the computer. E-HSS is the online Medical system, where whole the process of the hospitalization is being implemented through internet, This is a WEB APPLICATION which can be a good solution for the medical field , where the Doctors and patient are too far with each other , but the system which interact to patient be a computer and performs the diagnosing of disease which is DISEASE RECOGNITION by selecting symptoms, and then symptoms are checked from the knowledge base for the recognition of the disease and suggests treatment of disease, It also includes the information portion DISEASE INFORMATION containing list of diseases where user can view the disease, it also contains the LABORTARY TEST portion, which physically doesn't test, but by inserting the resulted values to a particular test, it will check the parameter values of report and make a process to identify disease and tell a solution for the disease from knowledge base.

Keywords: Artificial Intelligence, Expert systems, Disease recognition, Disease information, Laboratory Test

INTRODUCTION

Worldwide e-Health is the normal supposition of our joint e-Health struggles, and will convey unbelievable and fine modifications to our world by growing contact, and justice of entrance and usability, to healthcare for most of the world residents and its troubles. For this, there will be the obligation to utilize globally scattered and shared healthcare credentials, and to have amalgamated inter-jurisdictional agreements on matters such as contact and authorizations (Richard *et al.,* 2004). e-Commerce reported by the UN Secretary address of General is vital characteristic of business in 21st century. Not later then is it a excess for states, rather it is a intended need to organize for countries to reach economic and business fortune as well as public achievability. One of the chief regions within e-commerce that has to work on full attentiveness is e-Health. This is due to the fact that healthcare has normally been lethargic in implementing information technologies (Nilmini *et al.,* 2005). Starting through a short beginning into recent challenges and perceptions of the healthcare spot, it is encouraged the use of Movable Network structures within this ground sustaining the patient's movement desires and the want for working out and data challenging requests. Heart Checking and Crisis of the Akogrimo Mobile Grid platform is discussed and Mobile Grid bounded experiences are decorated (Loos, 2002). The Med CERTAIN style combines features of customer education, helping information workers to implement best training approaches, encouraging self-labeling by figures foundations, external assessments and observing. The difference to usual "kitemarking" (seal of approval) methods is that "quality" is not defined as something that can be empirically and universally measured, but that preferences and needs of users can be taken into account and that at the other side end-user decides whether he/she regards the resource as reliable (Eysenbach *et al.*,2001). The discussion offered focuses upon the casual, shared, and traditional side of administrative management and device as spoken in clinical e-Health systems (Bangert and Doktor 2003). Healthcare distribution is being transformed by developments in e-Health and by the enabled, computer-literate the people. Which are equipped to be apart in their personal health and to achieve earnings of online improvements, fitness entries, and doctor web pages with e-mail, this fresh term of end user is slowly redefining the physician as patient connection. Such changes can crash positive outcome like improved clinical policymaking, increased ability, and supported

contact between doctors and patients (Marion, *et al.,* 2001). This portion defines the Patient Record Administrator and the Workflow toolset of the wireless centered electronic-health system Ward-In-Hand, recognized inside an IST European project and currently in practice in three clinic regions: Italy, Germany and Spain (Pappas *et al.*,2002). e-Health compromises the ironic latent of adding old-fashioned transfer of services and stations of communication in means that spread the healthcare establishment's skill to come across the requests of its patients. A varied array of issues touches the expansion and operation of e-Health creativities and applications (Nazi1, 2003). Future e-Health systems will contain of low-power on-body wireless sensors attached to mobile consumers that intermingle with a ubiquitous computing atmosphere to display the health and well being of patients in hospitals or at home. It is proposed the Personalized Administrative Scheme (PAS). This is is our proposed scheme with advised similarities of disease diagnostic system discussed in section 6 that was previously known as SMC (Lupu, *et al.*, 2007). Web with e-Commerce occurrences are permanently at balances with the non-operational construction and legal directive of health distribution. e-Healthcare delivers healthcare material, analysis, treatment, care, and suggesting of treatment in a nonlinear, nonhierarchical manner that rouses patients to "pass in" the organization at an immeasurable number of points, thus challenging recent observing paradigms (Terry, 2001). Hospital information classifications are growing near health information systems. This article targets at isolating both proven benefits and serious issues, and at discussing problems and possible solutions. Reports on HIS successes and failures were analyzed, and primary experiments were recognized. These researches are discussed against state of the art solutions. *Results:* In spite of demonstrated benefits, there are many simple problems than reports on accomplishments recommend. Among nowadays core problems are assimilation, human-computer interface, socio-technical matters, and support of techniques. Momentous struggles of all parties complicated in the health care process are needed to develop, implement, and estimate the ideas described (Kuhn and Giuse, 2001).

MATERIAL AND METHOD

Proposed System

e-Health Solution System is not to change Medical Science but it provides the medical solution for end users in form of e-patient, where he or she can remotely interact to system and find out disease by giving some symptoms to computer, in this way e-Health solution makes feasible diagnosis for patients, and also suggests particular treatment regarding the disease. This isn't the solution of all diseases of the medical science but it contains 48 diseases at moment and as a revolution of medical science to computer technology, therefore life is easy and patients or end-users are not bound to the Doctors or other resources of Medical Science. This "e-Health Solution System" is research-oriented project to provide the online solution for the patients in form of registered/authenticated users. In which patient should be registered to be part of the "e-Health solution System". Once the patient/user becomes the part of it, he/she can any time, be ready to diagnose his disease, and take the feasible solution for their disease. "e-Health Solution System" provides the information of the disease, in which, mostly patients/ or users/ or doctors, take difficulty to get information regarding the disease, so this provides facility to end users/doctors/patients to view particular disease, and see contents of particular disease, like, symptoms, reasons, complications, treatments and related Analysis report. In this way self-medical science can also take advantages from this portion and make their knowledge augmented. Other portion which is too a best in the diagnosis is the Laboratory test, which doesn't take test of patient online, but it takes the parameter values of tested report and by inputting these values, you can diagnose what is disease according to report, and also take information, treatment, reasons, complication, for that disease. Hence, all the diagnosis problems, by a Doctors, by test for particular treatment, and related information, are managed online for patient hence they can make their life easy at home.

Disease Recognition And Treatment

This section is very typical portion regarding the medical field in which, the patients are diagnosed for the particular disease. Actually this section has many symptoms, which are classified in some form of disease so that user can make a look on a particular portion for diagnosing that level mostly, real world experts, means doctors diagnose the system by just viewing the symptoms which are visible to the patient and by experience they make decisions about particular disease. This system is maintained as an artificial expert, or expert system, having three chief modules as user interface, inference engine and knowledge base, now the user interface as the web page browser, as a html page, and knowledge base is implemented through Microsoft Access database, and inference engine, whole is JSP (java server pages) java technology is used in this project. Inference engine is actually the processing of rules in which user/patient gives inputs to system from user interface in form of html page and gets input to process it, and acts as inference engine, from disease recognition portion,

which are the list of symptoms executed from the knowledge base and by checking them, these are firstly checked from the knowledge base, and some JSP pages, have functionality to provide the rules, which are the rule based algorithms implemented according to the knowledge acquired by the real world experts as doctor. So in our project we have knowledge base of 48 diseases categorized some of these as

Malaria and Typhoid Fevers

This portion has 22 Symptom which mostly are visible for MALARIA AND TYPHOID PATIENTS, so that
THREE TYPES OF MALARIA DISEASES

A. Bodily Malaria
B. Cerebral Malaria
C. Chronic Malaria

Bodily Malaria

a) Symptoms and signs of bodily malaria:

Symptoms and signs of bodily malaria are
1. Fever, coldness, throb and finally sweat
2. If fever is going from one week than spleen may be felt as increased.
3. Sometimes in Falciparum malaria the color of urine is changed this is called as black water fever.
When above symptoms are executed from knowledge some types of probability is calculated for that disease, for suppose these symptoms are visible on page like:

1. Fever
2. Coldness
3. Throb
4. Sweat
5. Fever after 1week spleen may be felt as increased
6. Sometimes color of urine is black water fever

These six combinations of symptoms are showing bodily malaria, we make a sub sets of these symptoms to evaluate probability like a set of bodily malaria has six symptoms can be multiple combinations

Note: - Fever is the key symptom, otherwise, no Disease is indicated by the system and combinations are shown in Exhibit 1
BODILYMALARIA={1,2,3,4,5,6},{1,2,3,4,5},{1,2,3,4},{1,2,3},{1,3,4,5,6}{1,2,3,5},{1,4,5,6},{1,2,5,6},{2,3,4,5,6},{2,3,4,5},{3,4,5,6},{1,4,5,6},{2,4,5,6},{1,5,6},{1,2,5},{2,5,6},{3,5,6},{1,4,5},{3,4,5,6},{4,5,6},{3,4,5},{2,3,5},{5,6},{4,5},{3,5},{2,5},{1,5},{5}.

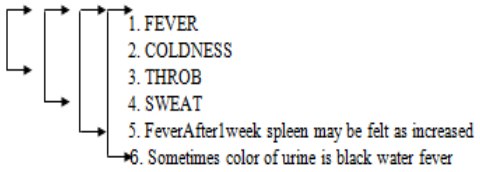


Exhibit 1: Combination of Symptoms

b) Treatment for Bodily Malaria

INJECTION:	Chloroquine 5cc in muscle (morning + night)
SYRUP:	Novalgin 4 tea spoons at the time of fever
TABLET:	Halfen 2 tablets for each 6 hours only 3 times

Note: - Fever is the key symptom otherwise; no Disease is indicated by the system.

Above combination shows the Bodily Malaria, only the Fever as first symptom and 5th symptom if included with any of other symptoms to show the bodily malaria, so that above calculated rules combination are counted as approximately 30 rules to diagnose the bodily malaria. If any of symptom + fever combination is not matched then, no bodily malaria is diagnosed because; it is the key symptom fever, which is, must in this combination. In this way BODILY MALARIA IS DIAGNOSED by passing symptoms checked by user/patient. From the combination of 22 symptoms are of malaria as above rules and handled by different combinations with different rules.

Throat fevers, Chest problems, Bones and joints diseases, Abdominal problems, Liver diseases and Renal diseases as classified diseases can have other diseases, which are diagnosed by symptoms, which are the parts of the knowledge base, actually each disease have 27 attributes, in the form of the knowledge base, which are, symptom1, symptom2, symptom3, symptom4, symptom5, symptom6, symptom7, symptom8, symptom9, symptom10, Minimum of 10 symptoms. Some diseases have reasoning, so that the knowledge base has reason1 to reason 10, as columns in the database. Some diseases has particular type of analysis (Test), which is included sometimes disease is not diagnosed then by Testing blood or other thing some analysis is being done. There is need of TABLETS, CAPSULES, SYRUPS, INJECTION, DRIPS, PREVENTION, and COMPLICATIONS are mostly used objects for the patient, so that we have maintained these all the factors as attributes of particular disease, and disease as object.

Complication is also the most important term for the patient so that, patient should know if he /she ignores the proper treatment then, what will be effect on his life, or will he/she be divert to other disease, so that we also included the complications potion in the form of complication1 to complication10.

DISEASE INFORMATION

This portion patient/user has to know about the disease symptoms, reasons, complications, treatments, and to know the Analysis (Test) if included in the knowledge base of the system. Any patient/user online can get information for a particular disease for enhancing the knowledge, mostly doctors can also get benefit from this portion, even though they can solve their complex situations and there related solutions **(Fig. 1)**.

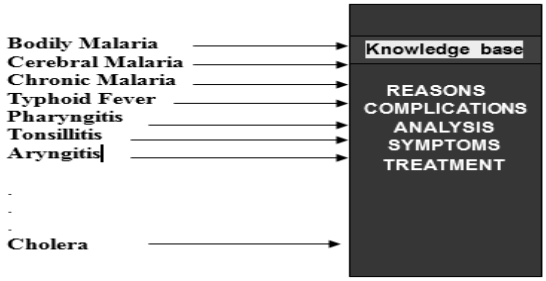


Fig. 1. Disease Information portion of e-hss.

LABORTARY TEST

This portion of the project is important solution for the medical science, it is not actually testing the physically checking blood test or other test but MALARIA PARASITE, WIDAL TEST, LFT, HBS, HEPATITUS C, and URINE D/R. So that, this Laboratory Test Portion get the attributes of a particular tested results and make a process to know the DISEASE, and tell a particular solution. **(Fig. 2)**.

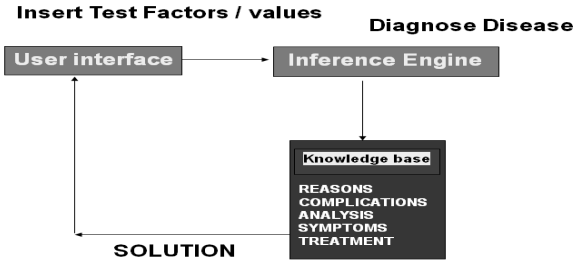


Fig. 2. Labortory Test portion of e-hss.

METHODOLOGIES AND AREAS COVERED

1. ARTIFICIAL INTELLIGENCE(AI)
2. WEB ENGINEERING(WE)
3. CLIENT-SERVER SIDE PROGRAMMING(JSP)
4. OBJECT ORIENTED ANALYSIS & DESIGN (OOAD).
5. PROBABILITY AND RANDOM PROCESSES

ARTIFICIAL INTELLIGENCE (AI)

e-hss As Expert System **(Fig. 3).**

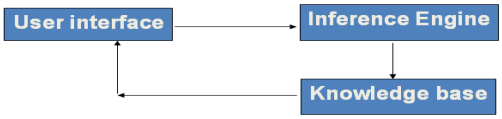


Fig. 3. e-hss as expert system

- USER INTERFACE as (WEB BROWSER)
- KNOWLEDGE BASE as(MS ACCESS)
- INFERENCE ENGINE as **JSP(JAVA SERVER PAGES)**

Knowledge Base

1. Disease name
2. Symptom1 to symptom10
3. Complication1 to complication10
4. Reason1 to reason10
5. Tablet1 to tablet5
6. Capsule1 to capsule5
7. Syrup1 to syrup5
8. Injection1 to injection5
9. Drip1 to drip5

NOTE: - MINIMUM AND MAXIMUM RANGES OF ATTRIBUTES PRESENT IN e-hss

Inference Engine

1. Fever
2. Coldness
3. Throb
4. Sweat
5. Fever after 1 week spleen may be felt as increased
6. Sometimes color of urine is black water fever

FOR BODILY MALARIA = 31 COMBINATIONS

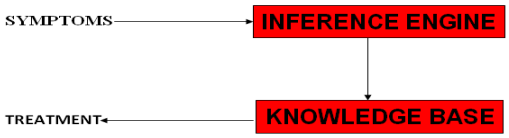


Fig. 4. Inference Engine of e-hss.

Object Oriented analysis and Design

1. Identification of actors with use cases
2. Use case course of events
3. Use case model diagrams
4. Use case dependency diagrams
5. Class diagrams
6. Class association diagrams
7. Sequence diagrams
8. Collaboration diagrams
9. State diagrams
10. Activity diagrams
11. Component and deployment diagrams

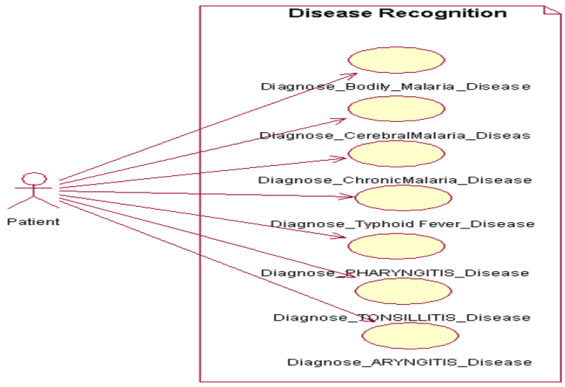


Fig. 5. Use case model diagram of Disease Recognition

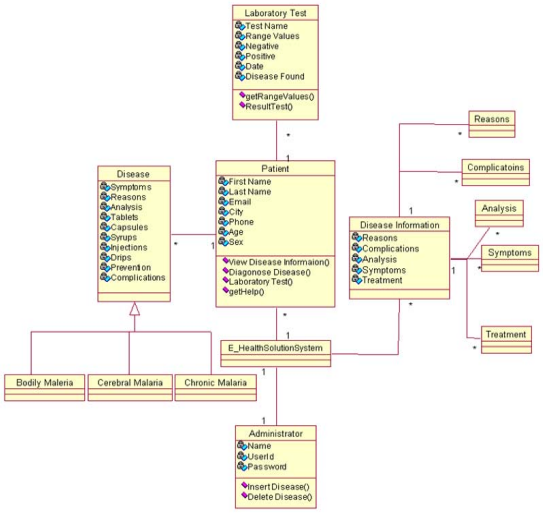


Fig. 6. Class association diagram of e-hss



Fig.. 7 Sequence Diagram of e-hss

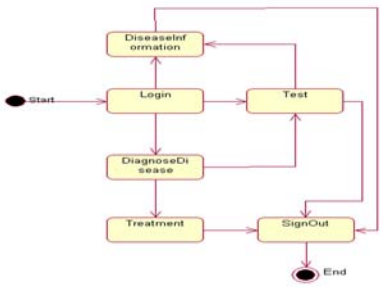


Fig.. 8 State diagram of e-hss

RESULTS AND DISCUSSION

Results of this research will help medical practitioners and online patients in accurate diagnoses of all common diseases along with treatment, complications and reasons if any.

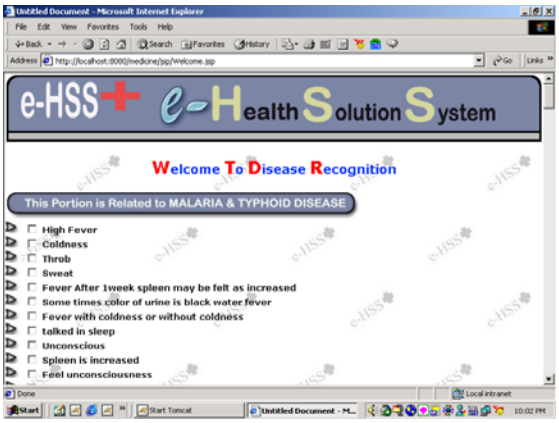


Fig. 9. Disease Recognition page in eHealth Solution System

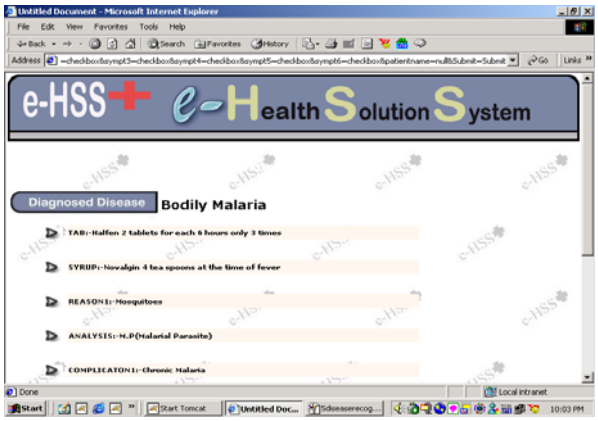


Fig. 10 Recognized disease in Disease Recognition page advised Treatment, Complications, Reasons and related analysis Test

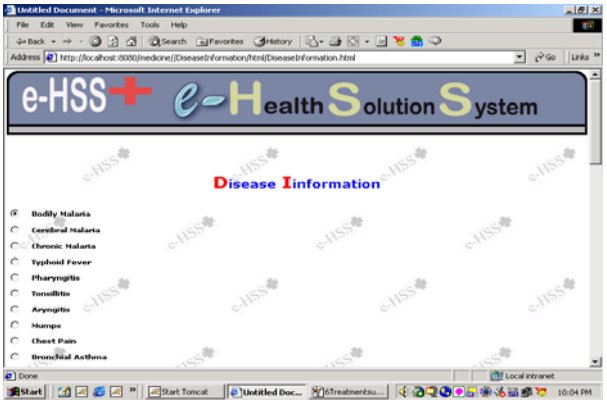


Fig. 11. Disease Information page in eHealth Solution System



Fig. 12. Disease Information Contents page in eHSS



Fig.13. Laboratory Test Factors Page eHealth Solution System

CONCLUSION

E-Health Solution System has recently been explored as part of information technology and telemedicine field, Administrator option must be available in e-hss to make system up to date and every medical research in the form of disease and treatment must be up to date without considering the age of available diseases and there treatment because disease and its treatment can be changed at the time is changing so the capability of this system must be intelligent to cover and provide the solution of the problems.

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