Controlling contagious diseases by adopting DTH technique on Case Based Reasoning

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Abstract – **In this paper we are proposing a new analysis technique called Data tuple-Test sampling-Health record technique on Case Based Reasoning in the field of Artificial Intelligence that gives a great result in medical survey to control the spread of contagious diseases in the initial stages [6][2]. Medical surveys' are done to find out the causes and reasons why and when the people of a particular area or a zone are affected by a disease and causes for spread. DTH technique is a problem solving methodology based on reutilizing specific medical knowledge of previously experienced and current problem situations, where the outcome represents the result by applying a particular medicine to a particular disease. It uses previous knowledge about the diseases and causes from the existing survey reports and applies them in the present usage by which it percepts the future knowledge that can help in making a quick and an easy survey to find out causes for risky contagious cases.**

Index Terms – **Tuple, Precedent cases, Contagious diseases, Case Based Reasoning, Severity.**

I.INTRODUCTION

Case based reasoning is a problem solving methodology which is based on reutilizing specific knowledge of previously experienced and medical education from which we concrete problem situations (cases) [1][6]. A typical Case Based reasoning system consists of a triple: problem, analysis, solution, where the outcome represents the result of applying a particular solution to a particular problem based on the prioritization [2]. Conditions that are taken in the previous issues will be recorded as standard cases and same type of solution sets will be implemented whenever a similar problem occurs [2].

II.REPORTS & RELATED WORK

In this survey is the most important step is in gathering the precedent cases with domain knowledge in developing a sound knowledge base [7]. Developed knowledge base has to be scrutinized multiple times from various medical, internet and research levels so as to conform the highest level of accuracy in the cases of medical dosages, drug being specified to the concern disease. Contagious diseases have different severities at different age groups based on specific area they live. Before developing the knowledge base it is necessary to determine the case number for our reference, name of the disease, symptoms for the disease, market name for the medicine, dosage specified, severity of the disease, contagious factor and risk rate in a knowledge base. These details will be used as a standard tuple for cross evaluation of test data in further study. Once the collected data is sufficient enough for our analysis, then next step is to determine which may the relevant disease in the highest spread of severity.

Case No	Disease Name	Symptoms	Medicine Name	Dosage	Severity	Contagious (Yes/No)	Risk Rate
1	Allergic Bronchitic	Breathing problem, Cough, Sore throat, headaches, Chest pain, Bluish-gray skin color, Swelling lips	Aldaya Tablet,Alred Tablet, candid-B ointment, Fluconazole, Onecan 150 tablets, Scables soap, Scaboma lotion	30 mg/day	High	Yes	High
2	Asthama	Breathing problem, Cough,Cold, Chest tightness	Almax 500, Betnasol, Asthalin, Cetrigen	50 mg/day	Medium	Yes	Medium
3	Brain fever	Headache, Fever, Low BP	Greennil, Wokocef, Zinowit	51.55 mg/day	Medium	Yes	Medium
4	Chickenpox	Fever, Headache, sore throat, sick, Tired, Not hungry	Cetrovel, Herpiking 400 (antibiotic), Becomplex	26.22 mg/day	High	Yes	High

5	Diarrhea	Thirsty, Illness, Low BP, Fat, Malabsorption, Bacterial over growth of small intenstine	Cebran-Oz (antibiotic), Eldober, Levbid, Motofen	51.55 mg/day	Medium	Yes	Medium
6	Diphtheria	Bluish color skin, fever, Painful swallowing, Skin lesions	O-cebran-Oz, Redotiol	51.55 mg/day	Medium	Yes	Medium
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502	Scabies	Itching, Rashes	Prazmoxine lotion, Onecan Tablet, Candid-B, Candiderm	15 ml/day	High	Yes	High
503	smallpox	Fever, Headache, Tired,Illness	Setrigin, Acivir 400 MG	80 mg/day	Medium	Yes	Medium
504	Tonsils	Fever, Throat pain, Painful Swallowing	Bluemox 500, Dyclomal	50 mg/day	Low	Yes	Low
505	Viral fever	Cold, Cough, Fever	Dolo 650, Sibran 500	43.33 mg/day 50 mg/day	High	Yes	High

III. MODUS-PONENS INFERENCE RULE

Modus ponens inference rule is also known as Implication-Elimination principle where it states that conclusion can be inferred from an implication and its premise [14]. A proof system is formed from a set of rules chained together to form proofs, also called derivations. Any derivation has only one final conclusion, which is the statement proved or derived. If premises are left unsatisfied in the derivation, then the derivation is a proof of a hypothetical statement: "If the premises hold, then the conclusion holds [11]."This expression states that whenever in the course of some logical derivation the given premises have been obtained, the specified conclusion can be taken for granted as well. The exact formal language that is used to describe both premises and conclusions depends on the actual context of the derivations such as $(\propto \to \beta)$.Typically, a rule of inference preserves truth, a semantic property [14]. In many-valued logic, it preserves a general designation. [15] But a rule of inference's action is purely syntactic and does not need to preserve any semantic property any function from sets of formulae to formulae counts as a rule of inference [11].

Usually only rules that are recursive are important i.e. rules such that there is an effective procedure for determining whether any given formula is the conclusion of a given set of formulae according to the rule. Rules of inference are easy to adopt and also often formulated as schemata employing meta-variables. In the rule (schema) above, the Meta variables $\propto$ and β can be instantiated to any element of the universe (or sometimes, by convention, a restricted subset such as propositions) to form an infinite set of inference rules on real world [1] [15].

IV .FUNCTIONALITY OF DTH IN CBR

A. Functioning of CBR

The entire activity adopted in a Case based reasoning system can be summarized into a simple case based reasoning cycle as shown below which consists of four main stages.[1][8][18].
(1) Retrieve, (2) Re use, (3) Revise and (4) Retain
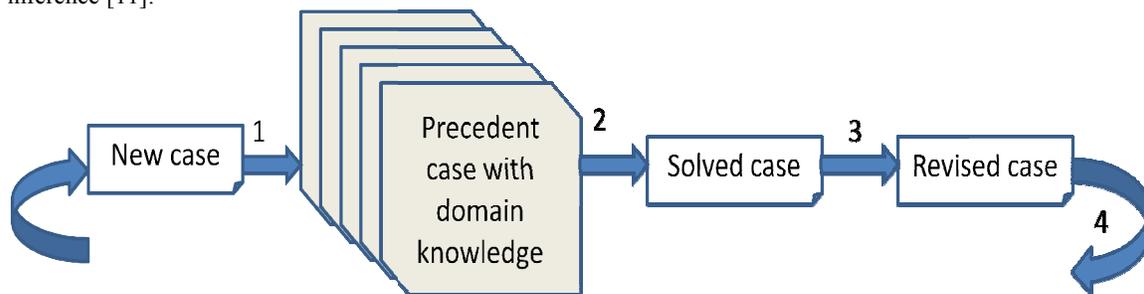
In the Retrieve stage, the system selects subsets of cases from the case base that are relevant to the current problem. The Reuse stage adopts the solution of the cases selected in the retrieve stage to the current problem. In the Revise stage, the obtained solution is examined by an oracle, which gives the correct solution (as in supervised learning) [8]. Finally, in the Retain stage, the system decides whether to incorporate the new solved case into the case base or not. The Case based reasoning systems only need to perform the minimum amount of generalization required to solve the problem at hand [2].

B. Adopting DTH technique

Data tuple – Test sampling – Health record analysis technique can be adopted by using Modus ponens inference rule in Case Based Reasoning. Here the quantity of medical dosage consumed in an area is considered as the data under a particular tuple [12]. Test sampling is done regularly on the amount of increase of dosage of a particular medicine. From this detailing we can analyze the increase in spread of any particular contagious disease [8]. It helps in recording the conditions in its initial stages as per the cycle shown below
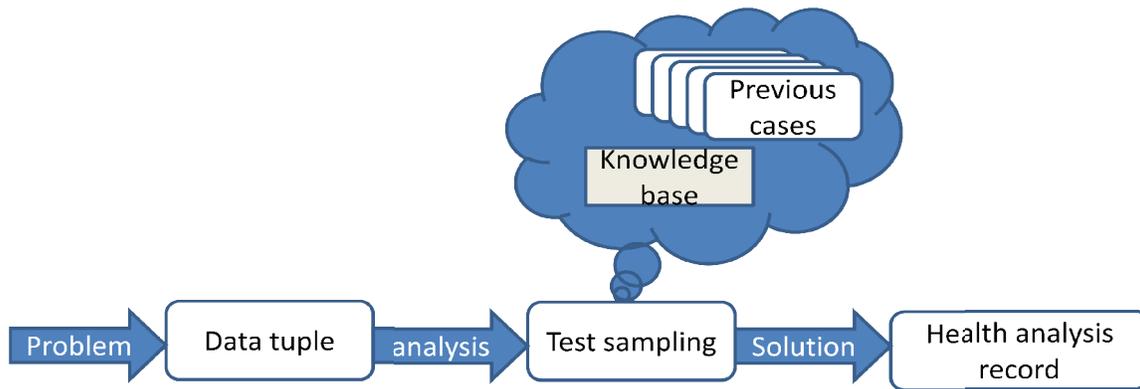

Fig 2: Data tuple-Test sampling-Health record cycle

C. Steps adopted in DTH Technique:

1. Record all the diseases along with the medicine, dosage required, treatment procedure, causes for it.
2. Whenever a new case is identified it is considered as problem and the data tuple has to be verified with existing condition [8].
3. Analysis can be done on the tuple by adopting the Modus-ponens inference rule, where all the precious cases are considered as 'α' values and the satisfying 'β' can be determined [14].
4. Once the unique 'β' value increase is determined, relevant precautions and measures can be taken.

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5. Thus health records can be generated and maintained for future knowledge.

V. RESULTS AND DISCUSSIONS

A. Common diseases notified in test sampling

As per the survey, usage of paramedic and dosages of medicine in a specific area, relatively the common diseases in (Tirupati, Andhra Pradesh, India) are Brain fever, Chicken Pox, Viral Fever. The following are the causes, harms, and the preventions of the common diseases [19]. The below given table will be the outcome of the DTH technique. From these results we can analyze the causes and control the disease spread in the initial levels.

CaseNo	Disease	Cause	Medicine
3	Brain fever	Bacteria, Virus, rarely a fungus	Greennil,Wokocel, Zinowit
4	Chicken Pox	Varicella zoster virus	Cetrovel Herpiking 400 (antibiotic), Becomplex
505	Viral fever	Bacteria, Virus	Dolo 650, Sibran 500

B. Health analysis record

The below given table explains common diseases, symptoms, medicine name, dosage, severity, reasons, precautions for those particular disease as per the risk rate. Based on the risk rate anomaly (High/Medium/Low), precautions are taken to see that

the disease will not spread anymore and cause further problems to others in the area. Common symptoms in the tuple (α_n) can be matched and analyzed. Risk rate factor completely depends on the amount of dosage being used and increase in the usage of dosage content. Depending on the risk rate the resultant table can be rearranged and necessary steps can be taken to

control the diseases based on the rate of spread [16] [19]. Awareness sessions, television advertisements, and health camps can be taken up by the medical colleges and research centers at nodal areas to bring the awareness on the severity and the fast spread of the disease. Medicine can be pre supplied and action on controlling it and avoiding it permanently can be done if DTH technique survey is done with highest precision. Below given table is a simple resultant generated as an outcome of our data sampling being collected in our survey.

Case No	Disease Name	Symptoms	Medicine Name	Dosage	Severity	Contagious (Yes/No)	Risk rate
505	Viral fever	Cough, Cold, High Temperature	Dolo 650, Sibran 500	43.33mg/day 50 mg/day	High	Yes	High
3	Brain fever	Headache, Fever, Low BP, More loss of white blood cells	Greennil, Wokocel, Zinowit	51.55 mg/day	Medium	Yes	Medium
4	Chickenpox	Fever, Headache, Sick,Tired, Not very hungry, Sore throat	Cetrovel Herpiking 400 (antibiotic), Cobadex, Becomplex	26.22 mg/day	Low	Yes	Low

VI. CONCLUSION

Adopting DTH in Case Based Reasoning in prevention and controlling of contagious diseases is possible by adopting the Modus Ponens inference rule. As we believe that prevention is better than cure, we are trying to get this into reality. This technique is useful to medicinal production units to understand the upcoming requirement of medicine in a particular area. Permanent precaution measures can also be taken to analyze, control and prevent the spread of contagious diseases by proper medical survey. Case-based reasoning plays a major role in calculating the causes using present knowledge and predicting the future scope by providing the relevant solutions and preventive measures. Present medical survey systems are not fruitful because they calculate the issues once the disease gets spread and people face them. Here we proposed DTH technique in CBR method where we are preventing the disease even before it starts spreading in an area. This technique can be adopted by the ministry of health and other medical organizations for yielding a better result in medical survey.

VII. FUTURE SCOPE

This technique can be expanded and adopted to find out the reasons and remedies for death rate due to various diseases. It can also be used by expert medical systems in helping the house surgeons and junior doctors for prescribing medical aid and advanced learning. Health chat-bots and online paramedical assistance systems can be developed by medical agencies and universities.

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