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An Expert System for Genital Problems in Infants

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Abstract

Genital problems in infants is one of the most common problems which requiring fast intervention in the newborn period. A few weeks after the baby was born, the parents finally posed the question that the baby "Is it our baby OK?" It being how the baby look like. Female genital comprises all procedures that involve partial or total removal of the external female genitalia, or other injury to the female genital organs for non-medical reasons. In this paper we present an expert system that help parent diagnose the genital problems in their newly born children. SL5 Object expert system language was used to design and implement this expert system.

Keywords: Artificial Intelligence, Expert Systems, SL5 Object language, Genital Problems in Infants

Introduction

Newborn children screening is a must for examining every newborn for persuaded dangerous or potentially deadly disorders that aren't otherwise obvious at birth[3].

a lot of these are metabolic disorders (usually known as "inborn errors of metabolism") that interfere with the body's use of nutrients to preserve in good physical shape tissues and create energy. Other disorders that screening may discover consist of problems with hormones or the blood[4].

In fact, metabolic and other inherited disorders may hold back an infant's normal physical and mental growth in a diversity of habits. And parents may go by along the gene for a certain disorder without even knowing that they are carriers[3].

With a straightforward blood check, doctors frequently can tell whether newborns have definite conditions that could eventually cause problems. Although these conditions are considered uncommon and the majority of babies are given a fresh bill of health, early on diagnosis and proper treatment may make the difference among lifelong impairment and healthy development[4].



Fig 1: Shows healthy baby

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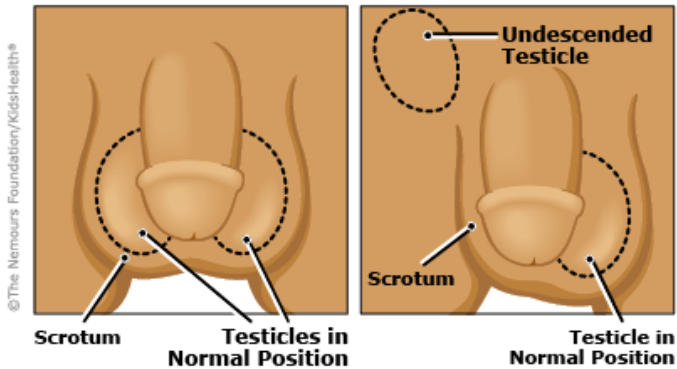


Fig 2: shows normal baby testicle

Expert Systems Definition

Expert system is a somewhat an old term that describes a computer program that imitate the judgment and performance of a human or an association that own expert knowledge and understanding in a specified field[1,2]. Today, more usually known as artificial intelligence, expert systems have a lengthy history dating back to the 1970s. But naturally, such a system integrates a knowledge base containing collected experience and an inference engine -- a group of rules for applying the knowledge base to each scrupulous situation that is explained to the program. Complicated expert systems can be improved with add-ons to the knowledge base or to the group of rules[2]. Expert systems have a good role in financial services, healthcare, manufacturing and video games.

What are expert systems?

The idea of expert systems was first developed in the 1970s by Edward Feigenbaum founder of the Knowledge Systems at Stanford University. Feigenbaum explained that the world was groing from data processing to "knowledge processing," a transition which was being permitted by new processor technology and computer architectures[2]. Two early expert systems broke ground in the healthcare space for medical diagnoses: Dendral, which assisted

chemists recognize organic molecules, and MYCIN, which assisted to recognize bacteria such as bacteremia and meningitis, and to recommend the treatment[24].

Expert systems and artificial intelligence

It is in artificial intelligence that expert systems have had the majority of impact, especially in finance, telecommunications, customer service, transportation, aviation, and more lately, written communication[11,12,13]. Artificial intelligence systems constructed on expert systems by using technologies such as machine learning, natural language processing, speech recognition and machine vision, all of which are central to highly developed systems such as IBM's Watson[14].

Advantages of Expert Systems

- Expert system advice is available all the time
- Knowledge of expert staff can be captured to some extent before they go away.
- Can be used as a training aid to increase the expertise of a person
- Makes rational decisions without any emotional overhead
- Does not get tired or overworked.
- Efficient way of getting answers as it does not involve additional help staff e.g. automated help systems
- Natural language interface would make the expert system more human friendly[12]

Materials & Methods

The proposed expert system will ask the user a few questions related the symptoms of the patient and end up with the diagnosis and the advise for the treatment. Then this expert system shows the user some information about the disease and some advices telling him/her how to deal with the baby. Figure 3 shows the decision tree of the expert system for diagnosing the genital problems in infants.

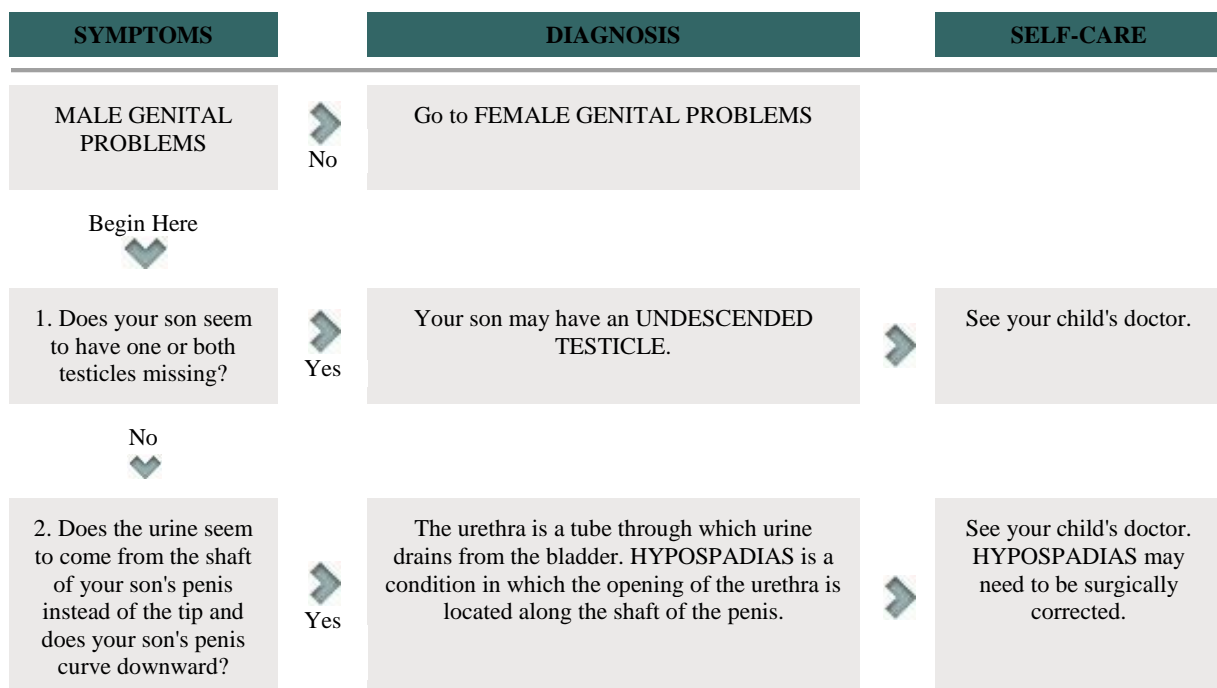




Fig 3: Decision Tree of the expert system

Background

Many expert systems have been designed [1,2,5-7,8-10,15-31] to help facilitating diagnosing and managing a lot of diseases and medical problems which considered as a part

of applying Artificial Intelligence and computer science in order to help doctors, hospitals and health care facilities decision making to enable them to offer their health services in the right way. Some of them are listed below.

Expert system interface

Our proposed expert system is written in SL5 Object expert system language which is a forward chaining and easy to use[2]. Figure 2,3 and 4, shows a few screen shots about the execution of the genital problems in infants diagnosing expert system. The first one contains some information about the purpose of the expert system. The second one contains how could a user interact with expert system by choosing an answer for the questions asked. The last one contains the conclusion showing windows for the title of the expert system, window for the diagnosed problem, and a window for the advice to the user telling him/her how to treat a problem.

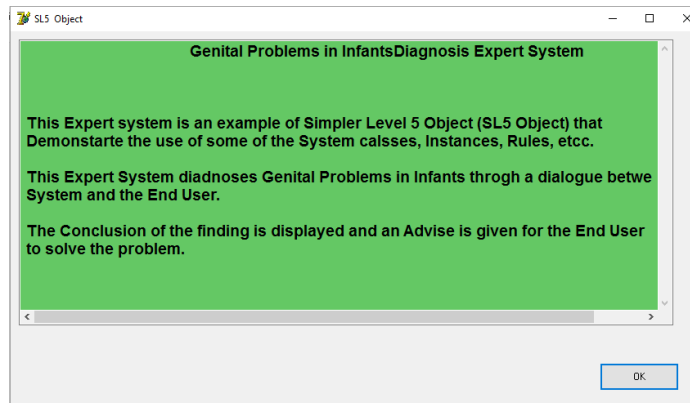


Fig 4: Shows the introduction of the expert system

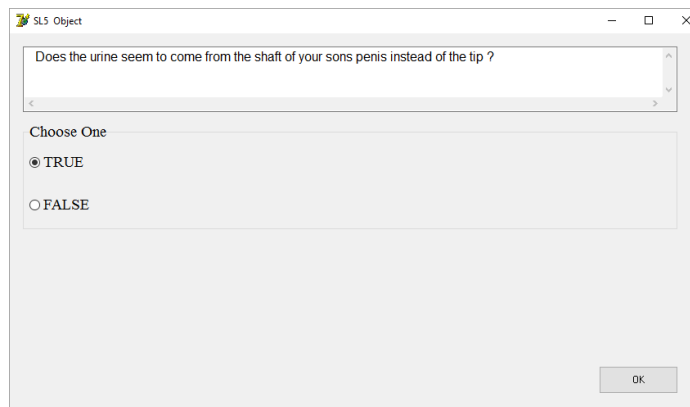


Fig 4: Shows a sample question asked the expert system

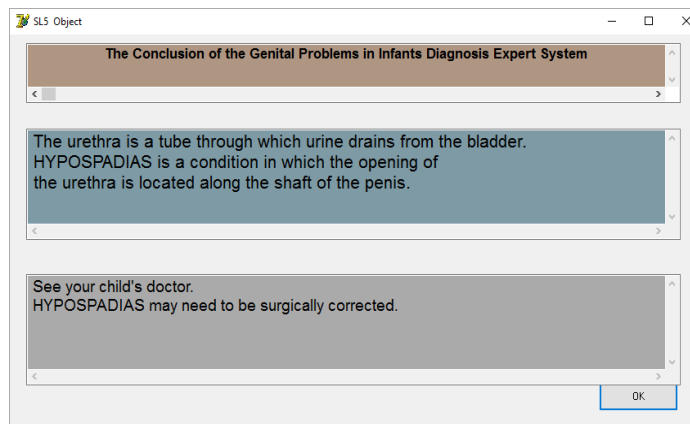


Fig 5: Shows the conclusion of the expert system

Conclusion

Genitale problems in infants is considered one of the most common problems which requires fast intervention in the

newborn baby period. In this paper, we presented a proposed expert system which was designed and developed using SL5 Object expert systems language in order to help physicians and parents in diagnosing their kid's Gentile problems in an easier and more precise way than before. This expert system is simple, fast and easy to use.

Expert system source code

```

ATTRIBUTE start SIMPLE
ATTRIBUTE MALE GENITAL PROBLEMS SIMPLE
ATTRIBUTE Does your son seem to have one or both
testicles missing SIMPLE
ATTRIBUTE Does the urine seem to come from the shaft
of your sons penis instead of the tip SIMPLE
ATTRIBUTE Is there still is a lot of skin surrounding the
tip of your sons penis even though your son has been
circumcised SIMPLE
ATTRIBUTE Does it seem like your sons foreskin is too
tight to pull back SIMPLE
ATTRIBUTE Is it difficult to tell the sex of your infant at
birth or shortly after SIMPLE
ATTRIBUTE Does your infant daughter have a thick
discharge or bleeding from the vaginal opening SIMPLE
ATTRIBUTE Is it difficult to tell the sex of your infant at
birth or shortly after SIMPLE

```

```

INSTANCE the domain ISA domain
WITH start := TRUE

```

```

INSTANCE the application ISA application
WITH title display := introduction
WITH conclusion display := Conc
WITH numeric precision := 8
WITH simple query text := "

```

?*

is

"*

```

WITH numeric query text := "What is the value of :

```

*

of

"*

```

WITH string query text := "What is(are):

```

*

of

"*

```

WITH time query text := "What is(are):

```

*

of

"*

```

WITH interval query text := "What is(are):

```

*

of

"*

```

WITH compound query text := "What is(are):

```

*

of

"*

```

WITH multicomound query text := "What is(are):

```

*

of

"*

```

INSTANCE introduction ISA display

```

WITH wait := TRUE
WITH delay changes := FALSE
WITH items [1] := textbox 1

INSTANCE textbox 1 ISA textbox
WITH location := 10,10,800,350
WITH pen color := 0,0,0
WITH fill color := 100,200,100
WITH justify IS left
WITH font := "Arial"
WITH font style IS bold
WITH font size := 14
WITH text :="

Genital Problems in Infants Diagnosis Expert System

This Expert system is an example of Simpler Level 5 Object (SL5 Object) that Demonstrate the use of some of the System classes, Instances, Rules, etc.

This Expert System diagnoses Genital Problems in Infants through a dialogue between the System and the End User.

The Conclusion of the finding is displayed and an Advise is given for the End User to solve the problem."

INSTANCE Conc ISA display
WITH wait := TRUE
WITH delay changes := FALSE
WITH items [1] := title textbox
WITH items [2] := problem textbox
WITH items [3] := advise textbox

INSTANCE title textbox ISA textbox
WITH location := 20,10,800,70
WITH pen color := 0,0,0
WITH fill color := 175,150,130
WITH justify IS center
WITH font := "Arial"
WITH font style IS bold
WITH font size := 13
WITH text := " The Conclusion of the Genital Problems in Infants Diagnosis Expert System"

INSTANCE problem textbox ISA textbox
WITH location := 20,110,800,130
WITH pen color := 0,0,0
WITH fill color := 125,154,165
WITH justify IS left
WITH font := "Arial"
WITH font size := 16
WITH text :=" --====--"

INSTANCE advise textbox ISA textbox
WITH location := 20,280,800,130
WITH pen color := 0,0,0
WITH fill color := 170,170,170
WITH justify IS left
WITH font := "Arial"
WITH font size := 14
WITH text :=" --====--"

RULE R0
IF start
THEN ASK MALE GENITAL PROBLEMS

RULE R1
IF MALE GENITAL PROBLEMS
THEN ASK Does your son seem to have one or both testicles missing
ELSE ASK Does the urine seem to come from the shaft of your sons penis instead of the tip

RULE R2
IF Does your son seem to have one or both testicles missing
THEN text OF problem textbox := "Your son may have an UNDESCENDED TESTICLE"
AND text OF advise textbox := "See your child's doctor. "
AND exit OF the application := TRUE
ELSE ASK Does the urine seem to come from the shaft of your sons penis instead of the tip

RULE R3
IF Does the urine seem to come from the shaft of your sons penis instead of the tip
THEN text OF problem textbox := "The urethra is a tube through which urine drains from the bladder. HYPOSPADIAS is a condition in which the opening of the urethra is located along the shaft of the penis."
AND text OF advise textbox := "See your child's doctor. HYPOSPADIAS may need to be surgically corrected. "
AND exit OF the application := TRUE
ELSE ASK Is there still is a lot of skin surrounding the tip of your sons penis even though your son has been circumcised

RULE R4
IF Is there still is a lot of skin surrounding the tip of your sons penis even though your son has been circumcised
THEN text OF problem textbox := "Your son may have had an INCOMPLETECIRCUMCISION."
AND text OF advise textbox := "Carefully clean the foreskin on a regular basis. See your child's doctor to check whether the surgery needs to be repeated to correct the problem."
AND exit OF the application := TRUE
ELSE ASK Does it seem like your sons foreskin is too tight to pull back

RULE R5
IF Does it seem like your sons foreskin is too tight to pull back
THEN text OF problem textbox := "This condition is called PHIMOSIS."
AND text OF advise textbox := "See your child's doctor."
AND exit OF the application := TRUE
ELSE ASK Is it difficult to tell the sex of your infant at birth or shortly after

RULE R6
IF Is it difficult to tell the sex of your infant at birth or shortly after
THEN text OF problem textbox := "AMBIGUOUS GENITALIA is a birth defect in which the genitals

are not well-formed and are difficult to identify."
 AND text OF advise textbox := "Your child's doctor may perform some tests to identify the sex of your baby. Treatment may include hormone replacement or surgery."
 AND exit OF the application := TRUE
 ELSE text OF problem textbox := "See your child's doctor."
 AND text OF advise textbox := "*****"

RULE R7

IF Does your infant daughter have a thick discharge or bleeding from the vaginal opening
 THEN text OF problem textbox := "This may be related to an INFECTION in the vagina or in the bladder. Rarely, a TUMOR or TEAR of the tissues will cause bleeding."
 AND text OF advise textbox := "See your child's doctor."
 AND exit OF the application := TRUE
 ELSE ASK Is it difficult to tell the sex of your infant at birth or shortly after

RULE R8

IF Is it difficult to tell the sex of your infant at birth or shortly after
 THEN text OF problem textbox := "AMBIGUOUS GENITALIA is a birth defect in which the genitals are not well-formed and are difficult to identify."
 AND text OF advise textbox := "Your child's doctor may perform some tests to identify the sex of your baby. Treatment may include hormone replacement or surgery."
 AND exit OF the application := TRUE
 ELSE text OF problem textbox := "For more information, please talk to your doctor. If you think the problem is serious, call your doctor right away."
 AND text OF advise textbox := "*****"

END

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