

Adaptive Learning

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Abstract—The automatic programming is an essential phase in the adaptation of information systems because it allows the system to advance from its observations on the environment. The system is formed during the operation by creating gradually its own ontology of the domain; therefore it is necessary that the knowledge stored evolve in an automatic way and during operation without asking a large participation of the human user. In this sense, this article aims to analyze the different learning techniques and process the information relating to the context to which the objective of choosing the proper technique to the situation in order to facilitate the storage, access and exploitation of such information.

Index Terms—Adaptive learning, automatic programming, scalable system, experimentation, adaptation.

I. INTRODUCTION

The natural disasters shall designate the harmful effects of a sudden phenomenon, sustainable or intense, natural or human-caused. It distinguishes any particular situations including human losses and destruction on a large scale. In such situations, a reliable information and a good intervention can decrease the rate of damage it is for this reason we found several research for the development of systems of rescue and aid to decision making for the management of disasters but the particular problem in the field "decision Support" is that there is of artificial actors who will interact with a dynamic environment. In this environment, decision-making must be based on current state to adapt to the change from the outside. In this case, the system must be equipped with a large capacity of the automatic learning which refers to the analysis and to the implementation of the methods that allow a machine to evolve and fill the tasks difficult or impossible to fill by algorithmic means more conventional.

II. LEARNING

2.1 What is?

In a general sense, learn corresponds to the adaptation of individuals to their environment. Learn, is to change in the course of the life to adapt to the environment. Childhood is the principal period of this adaptation but the individuals adapt to changes in their environment throughout their lives. For humans, the environment is essentially physical, living, social (or cultural), emotional and technological. What is prepared by the individual during this adaptation within either of knowledge, either of the memories.

Learning is a criterion for human adaptation to a changeable environment but this criterion remains difficult or impossible to achieve for the conventional systems of regular or just the need of automatic learning or learning artificial to give systems the ability to improve its performance through interactions with the environment.

2.2 Automatic Learning

The automatic programming (machine Learning in English), which is one of the sub-domains of artificial intelligence, has for objective to extract and automatically exploit the information present in a set of data. This is the scientific discipline concerned for the development, analysis and implementation of automation methods which allow you to a machine (in the broad sense) to evolve through a process of learning, and thus to fulfill the tasks that it is difficult or impossible to fill by algorithmic means more conventional.

III. ADAPTATIF SYSTEM

Our goal is create a system for the management of natural disasters which is a difficult mission view the amount of data non-structured and distributed that

receives the system and the contents of the data provides a rich source of information that needs to be maintained, filter and organized to allow an efficient use of the objective to offer a solution or an appropriate action.

The establishment of such a system means the plunge in a dynamic environment where there are many dangerous situations that require a response adequate to perform it is for this reason our studies seek mechanisms to identify these situations and he proposed the actions to be taken to get by with less damage and all of this will be to base of learning for power to the system to adapt to the course of its exchanges with the environment in order to

aim at any time to the appropriate function. The general operation of the system follows the following steps: (Fig1)

As it is stated before the operation of the system follows three essential steps that allow the system to be scalable. These steps are to adapt according to the situation encountered in passing of the virtual state to the state concrete which is made following an actual event gives: it creates an instance of the system by the definition of the disaster, its category according to comments (usually data) and the services offered. This instance adapted must be saved for it to be reusable in other similar cases subject to several learning techniques and do the update for self-improvement.

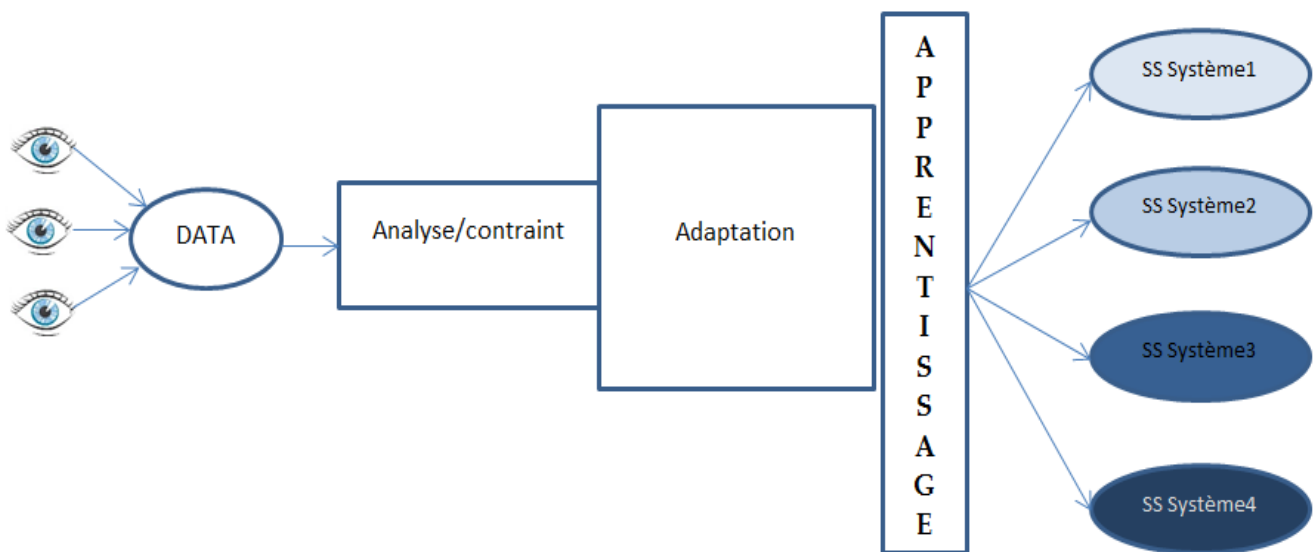


Fig 1: The steps of the operation of the system

IV COMPARATIVE STUDY OF TECHNIQUES FOR LEARNING

The problem of decision in the case of relief is a complex problem and in this case, the programming of the system (to learn how to adapt with a situation face) must meet several requirements: interactive, narratives, online, manipulate not only the quantitative data but still qualitative parameters. Even, we must partition our decision problem into several sub problems and apply other learning algorithms to each, based on its particular characteristics.

There are several algorithms for programming different: network of neuron, decision tree, Bayesian network ... Each, with its model of decision, is granted with the types of problem and the different types of application. Our system intervenes in the different situations and to ensure an effective use, we propose to choose and adapt the learning algorithm according to the situation encountered at base of its constraints and the degree of its compatibility with the different techniques in order to make the right choice. To do this, we will do a comparative study following which allows us to deduct and choose the suitable technique.

Below, we examine the adaptability of a few algorithms of learning common to the requirements of our problem:

4.1 Decision Tree

Set of rules to classify based on tests associated with attributes, organized as a tree. A tool to help in the decision which represents the situation more or less complex to which we must face in the graphic form of a shaft in such a manner as to show at the end of each branch the different possible results depending on the decisions taken at each step.

4.1.1 Advantage:

The decision tree is a technique very popular and usable views its simplicity and its benefits:

- The results of the shaft is explicit and easily interpretable
- It is a model easily programmable to assign new individuals
- CART "Classification And Regression Trees" allows the use of variables of all types (Continuous, discrete, categorical)

- Treatment of a large number of explanatory variables for subdividing the individuals in heterogeneous groups (classes)

- The decision rules are simple
- Little disturbance of individuals extremes because the results are isolated in small sheets.

4.1.2 Disadvantage

Even if this technique has many advantages but it also has disadvantages which are:

- Use of variables not simultaneous but sequential.
- "Butterfly Effect" → change a variable in the shaft, while the shaft changes.
- Use of heuristic rules : a method that provides rapidly (in temps polynomial) a workable solution, not necessarily optimal, for a problem of optimisation NP-difficile.
- Time extensive calculations (the search for criteria of division and pruning).

4.2 Neural Network

Network of neurones is a calculation model whose design is very schematically inspired of the functioning of biological neurons. The neural networks are usually optimized by methods of learning of probabilistic type, in particular Bayesian filtering. They are placed in a share in the family of statistical applications. The neural network works with real numbers, the response reflects a probability of certainty.

4.2.1 Advantage

- Ability to represent any function, linear or not, simple or complex.
- The learning from examples representative, by "retro propagation of Errors". The learning (or construction of the model) is automatic
- Resistance to noise or the lack of reliability of the data.
- Simple to handle, much less work staff to provide that in the statistical analysis classic. > Behavior is less bad in case of low amount of data.
- For the novice user, the idea of learning is more simple to understand that the complexities of statistics multi variables.

4.2.2 Disadvantage

- The neural network does not always provide rule of exploitable by a human.
- It does not fit the requirement "explanatory memorandum" because it does not provide justification easy to interpret.
- The absence of systematic method for defining the best network topology and the number of neurons to place in the (or the layer(s) hidden(s).
- The choice of the initial values of the weights of the network and the adjustment of the not of learning which play an important role in the speed of convergence.

4.3 Bayesian Network

In computer science and statistics, the Bayesian network is a graphical model probabilistic representative of random variables in the form of a directed graph acyclic. Intuitively, they are at once: models of knowledge representation and of machines to calculate the conditional probabilities. For a given domain, it describes the causal relationships between variables of interest by a graph.

4.3.1 Advantage

The Bayesian Networks are often used, since they have not bad advantages compared to other techniques.

- The Bayesian Networks can represent intuitively an area of knowledge, a lot of experiences show that it is often easier to formalize the knowledge in the form of a causal graph that in the form of a system based on the rules.

- The Bayesian Networks can manage the set of incomplete data. And more the Bayesian networks allow you to learn the causal relationship which can help us to make decisions.

4.3.2 Disadvantage:

The observation of a cause or of several causes does not lead systematically the effect or the effects that depend on them, but only modifies the probability of the observed so this technique is not interactive. This technique may not respond well to changes in the environment and in this case, the relief cannot be guaranteed on time.

V PROPOSED SOLUTION

From the point of view of the situations being addressed and view the advantages and disadvantages of each technique, we present the above tables or we have grouped our needs the acquisition, representation and use of knowledge. The representation adopted for this comparison is the following:

"Each line corresponds to a characteristic or need, which can be an advantage, or the taking into account of a given problem.

"If the technique considered allows to take into account this problem, or has the advantage, a + sign is placed in the corresponding box.

"A signed * is place in the box of the best technique from the point of view of the characteristic considered.

TABLE I.
ACQUISITION OF GIVEN

| | Neural Network | Decision Tree | Bayesian Network |
|-----------------|----------------|---------------|------------------|
| Data only | | | |
| Joint | * | + | + |
| Incremental | + | | * |
| Incomplete Data | + | | * |

TABLE2.
REPRESENTATION

| | Neural Network | Decision Tree | Bayesian Network |
|-------------|----------------|---------------|------------------|
| Uncertainty | | | * |
| Readable | | + | * |
| Easy | + | * | |
| Homogeneity | | | * |

TABLE3.
USE

| | Neural Network | Decision Tree | Bayesian Network |
|-------------------|----------------|---------------|------------------|
| Queries developed | | | * |
| Economic Utility | + | | * |
| Performance | * | | |

The disasters are different situations to ensure a perfect functioning we propose to adapt the technique of learning according to the criteria presented previously. The adaptation will be through the automatic choice of the best technique which is represented by the star " * " and in the case where there are multiple criterion we will do a combination between the degree of satisfaction (+ , *).

CONCLUSIONS AND PROSPECTS

In general, the problem of the aid to decision is a complex problem, because of its characters. The system operates in the environment which changed a lot, it must confront with the altered situations or urgent, there are a lot of parameters and criteria to meet. The system of "simulation of relief" is able to learn the way to make the decision of the user to support the user in other situations. Usually, it must be split into several sub-problems and apply a particular algorithm for each.

The algorithm must satisfy several requirements: interactive, explanatory memorandum, online, "manipulate not only the quantitative data but still qualitative parameters". After the analysis of a few techniques we found that the use of adaptive learning is a proposal capable for having the best solution. But of course, it is good only with a part of the problem of general relief: that is the type of sub-problem as the ambulance rescueth them the victim or the fireman get rid fire ...

It has already used the character of the understanding to make the learning for a system which can approach to the capacity of human learning.

The search is still maintained in order to make a complete algorithm to give the possibility to a system to react as the human brain and putting as perspective the study of a method of classification of any type of a natural disaster and also the dangerous situations and criticism.

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