Applying Case-Based Reasoning for Helping Psychological Patients

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Abstract. The diagnosis of psychological problems often requires psychologists to consult the relevant literature to identify through the symptoms presented by their patients a specific treatment. This paper presents a study of an application of Case-Based Reasoning (CBR) to the Psychology field. It aims to apply a CBR tool in order to help psychologists to create a case database that can help them to find some cases related to a specific patient problem and adapt the similar cases retrieved by the system to a particular treatment for a given patient. The results show that the CBR tool proposed here is very useful for searching the most similar cases, offering psychologists a good support to find a similar treatment for a specific case.

Keywords: Case Based Reasoning (CBR), Psychology, Artificial Intelligence.

1 Introduction

Psychology in its present stage enables psychologist to adopt various approaches for the treatment of mental problems. As an area of human knowledge, psychology focuses on mental processes (feelings, thoughts and reasoning) and animal and human behavior.

The professional psychologist's performance aims to find explanations for the mechanisms involved in certain behaviors, thus enabling to prevent and/or change these behaviors by means of clinical psychology resources. To achieve that, psychologists can use various approaches (i.e. psychoanalysis, gestalt, psychodrama, resistentialism, behavioral cognition and behaviorism) to help them solve emotional problems.

For the psychological treatment of a patient, professional psychologists many times need to identify a technique or treatment adopted in a similar case, which may be used as the basis for this particular case. This can be achieved by consulting the specialized literature, which demands a lot of time to locate the approach or treatment suggested in a vast bibliography.

This study focuses on the application of Case-Based Reasoning -CBR [1] to the specific field of psychology, enabling to help psychologists with the treatment of diseases by means of therapies that were applied to patients who presented the same or similar symptoms.

Section 2 discusses some studies related to the topic in question. Section 3 presents the proposed model. Section 4 discusses the results and concludes the paper offering some suggestions for future research.

2 Related Studies

The application of CBR to psychology has been widely discussed in the literature. Hahn and Chater [2] studied the intersection between CBR, psychology and law, from the point of view of the concept of similarity that both areas adopt. For Hahn and Chater, psychology presents two research areas that are related to CBR: (i) An approach based on instances from the cognition area; and (ii) modeling and psychological experiments.

Despite the fact that CBR has a strong interaction with studies on cognitive psychology [3, 4] and presents a vast range of applications to the health sector, the CBR methodology has not registered so far any practical application to psychology.

3 Proposed Model

In the proposed model, psychologists concentrate on the approaches adopted in the treatment of their patients, recording successful cases and applied techniques within their own approaches, as there is a great variety of psychological methods and techniques. Additionally, psychologists - due to their specific education – usually adopt only some approaches in their daily praxis.

The proposed models consists basically of seven pieces of information about each stored case that are retrieved in order to identify similar cases: Marital status, sex, age, education, occupation, symptoms and applied technique (see Figure 2).

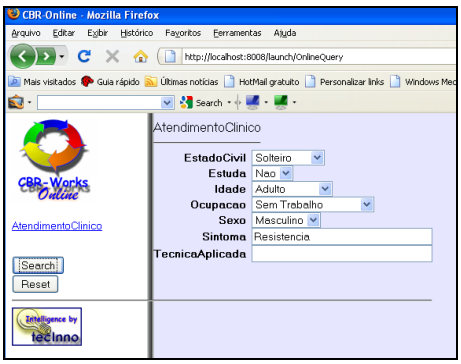

Fig. 2. Information used in the proposed model

The attributes were chosen so as to identify the personal characteristics of patients (marital status, sex, age, occupation and education), the symptom and technique adopted in their treatment. The importance of the symptom is obvious for the system. It is the symptom that identifies the problem that the psychologist is looking for in order to help the patient to solve. In some cases more than one symptom may appear. In these cases, for the sake of simplifying the searches, each symptom is registered separately with the respective treatment adopted. Another way to approach this question is to consider a main symptom for the sake of registering into the case base.

The techniques adopted by means of the Bipersonal Psychodrama approach were registered in the prototype here presented: Internal psychodrama, double, mirror, role inversion, soliloque, maximization and concretization [5]. The choice of this approach was based on one of the authors' professional practice experience.

The initial task of the psychologist along with the knowledge engineer is to provide the case base with the greatest possible number of cases already registered in the psychologist's professional practice. Usually these cases are registered in notes taken by psychologists and need to be tabulated with the register information of patients in order to generate an initial base. From the use of this system, the base is fed with new cases, enabling its growth an improving the precision of retrievals from the case base. CBR-Works enables the input of data with the information available about the case and retrieves the cases by similarity (see Figure 3).

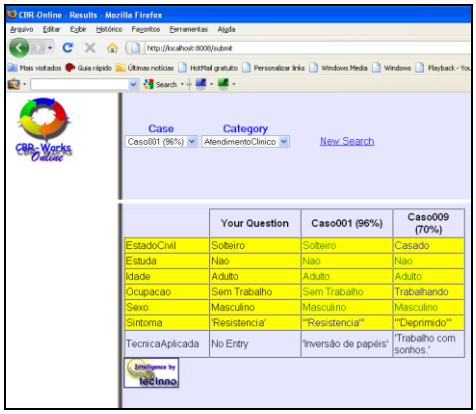

Fig. 3. Cases retrieved by the proposed model

4 Results and Discussion

The proposed model, despite its simplicity, showed the efficiency of the Case-Based Reasoning methodology applied to the field of psychology. By using a sparsely populated case base, the system identified the most similar cases from a hypothetical search of an adult single patient of the masculine sex who does not study or work and who presents a symptom of resistance (See Figure 2). The retrieved case with a similarity of 96% describes a patient with the same profile and symptom, identifying

as the therapeutic approach successfully adopted that of "role inversion" (Figure 3). The system also retrieved a case with a lower percentage of similarity (70%) in which the patient differs in terms of profile and symptom, despite presenting some attributes identical to the researched case.

The greatest difficulty in adopting the proposed model has to do with the manual feeding of the case base, once it is common among psychologists to manually take note of the cases under treatment. Another difficulty also identified is provide the case base with the existing literature, identifying all the necessary attributes to be fed into the system, as these attributes are not always presented in a thorough way in the available bibliography. Nevertheless, the cases with successful therapies registered in the literature are vital for the improvement of the data base to be used by psychologists, increasing the chances of successfully identifying (i.e. high similarity) cases similar to the researched one.

In the model presented here, due to the initial stage of the prototype, the number of registered cases is small, thus limiting the research context.

5 Conclusion

The applications that use Case-Based Reasoning techniques have increased along the years, but this increase does not occur in the same proportion of applications that use other AI technologies. This phenomenon occurs due to some factors that still hinder technical implementation as well as the acquisition of information about the cases, which requires a great deal of manual work among CBR engineers, IT specialists and psychologists.

The proposed application can offer positive contributions to psychology professionals as the quick retrieval of similar cases enables psychologists to find adequate therapies to a given patient.

Other studies can be developed by building an ontology to represent symptoms and respective techniques through the use of successful tools available in the market.

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