Case-Based Reasoning in the Care of Alzheimer’s Disease Patients

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Abstract. Planning the ongoing care of Alzheimer’s Disease (AD) patients is a complex task, marked by cases that change over time, multiple perspectives, and ethical issues. Geriatric interdisciplinary teams of physicians, nurses and social workers currently plan this care without computer assistance. Although AD is incurable, interventions are planned to improve the quality of life for patients and their families. Much of the reasoning involved is case-based, as clinicians look to case histories to learn which interventions are effective, to document clinical findings, and to train future health care professionals.

There is great variability among AD patients, and within the same patient over time. AD is not yet well enough understood for universally effective treatments to be available. The case-based reasoning (CBR) research paradigm complements the medical research approach of finding treatments effective for all patients by matching patients to treatments that were effective for similar patients in the past.

The Auguste Project is an effort to provide decision support for planning the ongoing care of AD patients, using CBR and other thought processes natural to members of geriatric interdisciplinary teams. System prototypes are used to explore the reasoning processes involved and to provide the forerunners of practical clinical tools. The first system prototype has just been completed. This prototype supports the decision to prescribe neuroleptic drugs to AD patients with behavioral problems. It uses CBR to determine if a neuroleptic drug should be prescribed and rule-based reasoning to select one of five approved neuroleptic drugs for a patient. The first system prototype serves as proof of concept that CBR is useful for planning ongoing care for AD patients. Additional prototypes are planned to explore the research issues raised.

1 Introduction

One hundred years ago, a fifty-one-year-old woman called Auguste D. was admitted to a clinic in Frankfurt, Germany. She had been suddenly beset by cognitive and personality changes, which were progressing insidiously. She was now jealous...
of her husband, to whom she had been happily married for nearly thirty years. She had become careless with her household money, would make mistakes in preparing meals, and would put things away and forget where they were. Auguste D. spent the last four and a half years of her life at the clinic, where her condition steadily deteriorated. She became disoriented as to time and place, anxious, agitated, and uncooperative. At the end, she was wholly unresponsive and bedridden 18.

The psychiatrist who cared for her, unfamiliar with this disease process, carefully documented her progress. When she died, he autopsied her brain, discovering neuritic plaques and neurofibrillary tangles. He lectured and wrote, sharing his findings with the leading psychiatrists of his day. He concluded one paper, On the whole, it is evident that we are dealing with a peculiar, little-known disease process... We must not be satisfied to force it into the existing group of well-known disease patterns. It is clear that there exist many more mental diseases than our textbooks indicate. In many such cases, a further histological examination must be effected to determine the characteristics of each single case. 2

Thus, Dr. Alois Alzheimer not only pioneered the investigation of the disease that bears his name, but also championed the use of case-based reasoning (CBR) in weak-theory domains.

Today, it is estimated that over twelve million people are afflicted with Alzheimer’s Disease (AD) 11. Case histories are still widely used to train health care professionals and to share clinical findings 17. There is still no cure, but interventions are planned to improve the quality of life for patients and their family members. Due to the wide variability among patients, and within the same patient over time, these interventions must be painstakingly tailored to each patient. No computer-based assistance is available for this time-consuming task.

The Auguste Project was begun to investigate how case-based and multimodal reasoning might model how health care professionals plan ongoing care for AD patients. Long-range goals are to:

1. gain a better understanding of the reasoning processes employed by health care professionals
2. learn what extensions are needed to CBR for a domain that includes:
   a) multiple, sometimes conflicting, perspectives of professionals from different disciplines
   b) cases that change over time
   c) ethical considerations and viewpoints
3. provide practical decision support tools for this difficult task

This paper describes the Auguste Project and its progress to date.

1 This translation from the original was excerpted from 18.