Chapter 13
Back Pain Data Collection Using Scalable Vector Graphics and Geographical Information Systems

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13.1 Introduction

According to a Department of Health survey, in Britain back pain affects 40% of the adult population, 5% of which have to take time off to recover (Boucher, 1999). This causes a large strain on the health system, with some 40% of back pain sufferers consulting a GP for help and 10% seeking alternative medicine therapy (Boucher, 1999). Due to the large number of people affected, back pain alone cost industry £9090 million in 1997/8 (Frank and De Souza, 2000), with between 90 and 100 million days of sickness and invalidity benefit paid out per year for back pain complaints (Frank and De Souza, 2000; Main, 1983; Papageorgiou et al., 1995). Back pain is not confined to the UK alone, but is a worldwide problem: in the United States, for instance, 19% of all workers’ compensation claims are made with regard to back pain. Although this is a lot less than the percentage of people affected by back pain in the UK, it should be noted that in the United States not all workers are covered by insurance and not all workers will make a claim for back pain (Jefferson and McGrath, 1996). Any improvement in the way that patients with back pain can be analyzed should therefore be viewed as one potentially capable of significantly saving both benefit expenditure and lost person-hours.

The problem with back pain is that “there exist no standardised clinical tests or investigations by which all people with low back pain can be evaluated” (Papageorgiou et al., 1995). Nor will there ever be, as different people have different pain thresholds and will be affected differently. It is also difficult for medical personnel to know what has caused the back pain, as there are potentially many different causes behind it (Frank and De Souza, 2000).

Due to the debilitating effect that back pain has on society, our research aimed to find a method that would allow correlations and patterns to be found between patients’ data, and therefore allow the medical world to draw conclusions as to the cause and effect of back pain. Within our research we devised and implemented four ways of visualization and accessing back pain datasets, all of which would enable the user to carry out deeper analysis on a dataset than is usually possible using standard database queries. This is the case as the human is able to compare and contrast information diagrammatically far faster and to a higher degree than just relying on statistical or numerical values.
13.1.1 Back Pain Questionnaires

The main medical work that is done to resolve back pain tends to be with patients that have chronic back pain. However, these patients may have developed psychological and emotional problems, due to having to deal with the pain. Because of these problems, patients can have difficulty describing their pain, which can lead to problems during the treatment. In some patients, the psychological problems may have aided the cause of the back pain, by adding stress to the body, or the stress of the back pain may itself have caused psychological problems (Ginzburg et al., 1988; Hildebrandt et al., 1988; Main, 1983; Mann III et al., 1992; Parker et al., 1995; Ransford et al., 1976; Uden et al., 1988; von Baeyer et al., 1983). It is because of this factor that patients suffering from back pain are usually asked to fill out questionnaires of different types in order to help the medical staff, not only to know where the pain is located but also to identify the patients’ mental state before treatment begins. The main questionnaires used for this purpose are:

- The Modified Somatic Perception Questionnaire (MSPQ), which assesses somatic anxiety (Main, 1983)
- The Roland and Morris (1983) questionnaire, which is used to measure the patient’s back pain-caused disability
- The Zung (1965) questionnaire, which assesses depression via the respondent giving answers to 20 questions using a self-rating scale

In addition, the patient is usually required to mark on a diagram of a human body, where the pain is located and the type of pain. This type of diagram is known as a “pain drawing” and forms the primary focus of our chapter. Accordingly, the structure of the chapter is as follows: the next section looks at pain drawings in more detail, examining the different types used in practice and their scoring methods, and finishes by highlighting limitations of current approaches. The subsequent section examines the feasibility of various technological solutions to overcome these limitations, and is followed by a description of the implementation of these solutions in practice. Finally, the developed solutions are then compared with respect to one another and the set of requirements they set out to fulfil, and conclusions subsequently drawn.

13.2 The Pain Drawing

Pain drawings, an example of which (used in our study) is shown in Figure 13.1, have been successfully used in pain centers for over 45 years (Palmer, 1949) and act as a simple self-assessment technique, originally designed to enable the recording of the spatial location and type of pain that a patient is suffering from (Ohlund et al., 1996; Parker et al., 1995; Rankine et al., 1998). They have a number of advantages, including being economic and simple to complete, and can also be used to monitor the change in a patient’s pain situation (Ohnmeiss et al., 1995). Over the years, different ways of evaluating and using pain drawings have been suggested.

Ransford et al. (1976) concluded that the pain drawings could be used not only as a location and pain recorder, but also as an economical psychological screening instrument to see if a patient would react well to back pain treatment. As previously mentioned, back pain can be caused by psychological and emotional problems, as