



18 September 2009

PATENTS ACT 1977

APPLICANT Roke Manor Research Limited

ISSUE Whether patent application number
GB0608420.6 complies with Section 1(2)

HEARING OFFICER Peter Slater

DECISION

Introduction

- 1 Patent application GB0608420.6 entitled “Dynamically updatable high speed pattern matcher” was filed on 28 April 2006 in the name of Roke Manor Research Limited. The application was published as GB2437560 on 31 October 2007.
- 2 The examiner maintains that the invention claimed in this application is excluded from patentability as a computer program and a mental act under section 1(2)(c) of the Patents Act 1977. The applicant has not been able to overcome this objection, despite amendments to the application.
- 3 The matter therefore came before me at a hearing on 20 July 2009 where the applicant was represented by Jan Payne and Neil Duxbury. The examiner Jake Collins was also present.

The Invention

- 4 The invention relates to a method of searching for user-specified strings of characters, or keywords in an input data stream using a finite state machine based on an Aho-Corasick algorithm. User-specified keywords are used to construct the state machine in the form of a “tree” structure having branches representing each of the user’s keywords into which the input data stream is then fed. The machine providing an output each time a match is detected between any of the specified keywords and the input data.

- 5 In prior-art systems, problems arise when the user adds to, deletes or changes the keywords in some other way which requires the state machine to be rebuilt or recompiled. This can take a considerable amount of time and processing power to achieve particularly, as in the prior-art, where the state machine is said to be built-up in a “breadth first” manner when the addition of new keywords requires all of the state transitions to be updated. For large keyword sets the computational cost of updating the entire structure is often excessive, requiring significant buffering of data or delays in processing the input data stream which may result in the loss of data, and may even prevent the structure from being updated whilst online.
- 6 The application provides a new method of constructing an Aho-Corasick state machine wherein the tree structure is built-up in a “depth first” manner, a branch at a time corresponding to any new keywords added by the user and requires only those states or nodes associated with that branch to be updated. This allegedly requires no buffering or loss of data and enables real-time online processing of the input data stream.
- 7 The most recent set of claims were filed on 19 June 2008 and include a single independent claim to a “method of searching text”. An additional set of claims were filed for my consideration prior to the hearing on 17 July 2009 including a number of minor amendments to the wording of claim 1 which are shown in bold below. Claim 1 reads as follows:

*1. A method of **on-line** searching a text string to locate occurrences of user specified patterns of words or phrases comprising character strings, said method comprising: receiving an input comprising **a large set of** user specified patterns that are to be searched for; based on said user specified patterns, constructing a finite state pattern matching machine that includes an Aho-Corasick tree having branches that comprise nodes connected by paths, go to links and failure links; processing the text **string** according to the state pattern matching machine to locate matches to the user specified patterns; and said state pattern matching machine outputting locations in said text string where said specified patterns appear; wherein, said finite state pattern matching machine is constructed first in a general depth first manner, for each path comprising links representing a single user specified pattern; wherein during construction of said finite state pattern matching machine, after a node is added, failure links or extended failure links from that node to other nodes are added.*

The Law

- 8 The examiner has raised an objection under section 1(2)(c) of the Patents Act 1977 that the invention is not patentable because it relates to a program for a computer as such and a mental act; the relevant provisions of this section of the Act are shown in bold below:

1(2) It is hereby declared that the following (amongst other things) are not inventions for the purpose of the Act, that is to say, anything which consists of –

(a)

(b)

(c) a scheme, rule, or method for performing **a mental act**, playing a game or doing business, or **a program for a computer**;

(d)

but the foregoing provisions shall prevent anything from being treated as an invention for the purposes of the Act only to the extent that a patent or application for a patent relates to that thing as such.

- 9 As explained in the notice published by the UK Intellectual Property Office on 8 December 2008¹, the starting point for determining whether an invention falls within the exclusions of section 1(2) is the judgment of the Court of Appeal in *Aerotel/Macrossan*².
- 10 The interpretation of section 1(2) has been considered by the Court of Appeal in *Symbian Ltd's Application*³. *Symbian* arose under the computer program exclusion, but as with its previous decision in *Aerotel*, the Court gave general guidance on section 1(2). Although the Court approached the question of excluded matter primarily on the basis of whether there was a technical contribution, it nevertheless (at paragraph 59) considered its conclusion in the light of the *Aerotel* approach. The Court was quite clear (see paragraphs 8-15) that the structured four-step approach to the question in *Aerotel* was never intended to be a new departure in domestic law; that it remained bound by its previous decisions, particularly *Merrill Lynch*⁴ which rested on whether the contribution was technical; and that any differences in the two approaches should affect neither the applicable principles nor the outcome in any particular case.

¹ <http://www.ipo.gov.uk/pro-types/pro-patent/p-law/p-pn/p-pn-computer.htm>

² *Aerotel Ltd v Telco Holdings Ltd and Macrossan's Application* [2006] EWCA Civ 1371; [2007] RPC 7

³ *Symbian Ltd v Comptroller-General of Patents*, [2009] RPC 1

⁴ *Merrill Lynch's Application* [1989] RPC 561

- 11 Subject to the clarification provided by *Symbian*, it is therefore still appropriate for me to proceed on the basis of the four-step approach explained at paragraphs 40-48 of *Aerotel/Macrossan* namely:
- 1) Properly construe the claim
 - 2) Identify the actual contribution (although at the application stage this might have to be the alleged contribution).
 - 3) Ask whether it falls solely within the excluded matter, which (see paragraph 45) is merely an expression of the “as such” qualification of section 1(2).
 - 4) If the third step has not covered it, check whether the actual or alleged contribution is actually technical.
- 12 The operation of this test is explained at paragraphs 40-48 of the decision. Paragraph 43 confirms that identification of the contribution is essentially a matter of determining what it is the inventor has really added to human knowledge, and involves looking at substance, not form. Paragraph 46 explains that the fourth step of checking whether the contribution is technical may not be necessary because the third step should have covered the point.
- 13 I will deal with the arguments put forward by the applicant as I apply the test set out in *Aerotel/Macrossan* to the present case.

Construing the claims

- 14 The first step of the test is to construe the claims. I do not think this presents any real problems since both the applicant and the examiner appear to agree as to the meaning of the claims. As I understand it, the claims in essence relate to a method of searching text for user-specified words or phrases using a finite state machine that includes an Aho-Corasick tree structure to locate matches within the text and to output locations within the text where the user specified words occur. The state machine being constructed in a particular way i.e. in a “depth first” manner as claimed.
- 15 The amended claims presented prior to the hearing put particular emphasis on the fact that the search takes place online. There was some discussion at the hearing surrounding the meaning of the word online and whether this just meant an arrangement where a computer was connected to, for example, a server on a network such as the Internet or whether it required something more. The agent suggested that the meaning of the word online required not only a connection between the computer and the network but that there was a requirement for the processing of data to be carried out simultaneously with its production drawing my attention to the meaning as defined in the “New Oxford Dictionary of English”. I am prepared to accept that definition.

- 16 The reference to “a large set of user specified patterns” is also somewhat unclear. However, for the purpose of my decision, I take this to mean a number of the order of thousands.

Identify the actual contribution

- 17 For the second step, it is necessary to identify the contribution made by the invention. Paragraph 43 of *Aerotel/Macrossan* explains that this is to be determined by asking what it is - as a matter of substance not form - that the invention has really added to human knowledge having regard to the problem to be solved, how the invention works and what its advantages are.
- 18 Again, I think there is a considerable amount of agreement here between the applicant and the examiner. The computer on which the search takes place is entirely conventional, and the way in which the search is carried out using an Aho-Corasick tree structure is no different to that disclosed in the prior-art. However, the contribution arises in the way in which the tree structure is constructed and/or updated i.e. in a “depth first” manner as opposed to a “breadth first” manner as was previously known in the prior-art. This means that the tree structure can be updated more quickly, without the need to recompile the whole structure, and thus requires little or no buffering and enables the search to take place without the need to take the computer off-line.

Does the contribution fall solely within excluded subject matter? Is the contribution technical in nature?

Computer program

- 19 The agent argues that the invention provides a technical contribution and is therefore more than just a computer program. Referring to the judgment in *Symbian*, the agent alleges that the invention is an example of where a more reliable processor results from the way in which the state machine or tree structure is constructed. Instead of losing the ability to search some of the data stream due to the time taken to reconstruct the tree following the addition of new keywords, the reconstruction is done far more quickly and enables new keywords to be incorporated into the search almost immediately, without any loss of data due to downtime or insufficient buffering. The invention therefore solves a real world problem in a technical manner and has an effect which is more than simply running a program on a computer.

- 20 The agent also refers to that part of the *Aerotel* judgment which refers back to *Gale*⁵, in which a change in the speed of how a computer works may be deemed to take an invention outside the computer program exclusion provided the contribution relates to a technical process outside the computer or it solves a technical problem within the computer. Without the present invention, the agent argues that the processing requirement is so high that a search could not be carried out at all. The invention is not simply a programmed computer, but a method of searching text which would not be possible without constructing the finite state machine in the claimed manner.
- 21 Furthermore, the agent alleges that the invention provides both an external technical process and a solution to an internal technical problem. The external technical process is that of inputting a data stream, processing the data and outputting a modified data stream in the form of locations in the text string where the specified patterns occur. This allows the user to extract only that content from the data stream which contains the specified patterns.
- 22 In the invention, only certain patterns are of interest, so all parts of the data stream in which those patterns do not appear are passed through or discarded. However, the pattern being sought changes from time to time. During this changeover, a conventional system would fail to find the new pattern, until the search engine had been reconstructed. The present invention enables the state machine to be rebuilt in such a way that the new pattern is searched for as soon as it is entered. Within the machine, the technical problem lies in updating the user specific patterns which are being searched for, without taking the system off-line, which would result in the loss of data, and an incomplete search of the input data stream.
- 23 Mr Duxbury also described how the invention could be used to detect the presence of viruses in incoming data. He argues that this is clearly technical in nature and solves a technical problem, the result being a better computer which is less susceptible to viruses. Whilst I have some sympathy with his argument, it can have no bearing on my decision as there is no such disclosure in the application as filed.
- 24 In the above paragraphs, I have set out the arguments raised by the agents as to why they consider the application to be patentable. In summary, their principle argument is that the invention provides an improved method of searching text in which the data structure can be rebuilt far more quickly with the result that no data is lost due to insufficient buffering, and there is no need as in the prior-art to take the computer off-line or to slow down the incoming data stream. This provides not only a technical solution to a technical problem but also results in a better more reliable processor.

⁵ Gale's Patent Application [1991] RPC 305

- 25 There is no doubt in my mind that the contribution requires a computer program for its implementation. However, the mere fact that the invention is effected in software does not mean that it should be immediately excluded as a computer program as such. What matters is whether or not the program provides a technical contribution.
- 26 I do not think that the contribution provides a better or faster computer as such; the computer itself is entirely conventional. What the applicant has done is to modify the way in which the search is carried out within the computer, and in particular, the way in which the tree structure is built or modified. The applicant has achieved this by altering the steps in the process required to construct the tree, and as the tree is implemented in software, by altering the program. What the applicant has effectively done is to produce, brilliant though it may be, a new computer program.
- 27 Does the program provide a technical contribution, I do not think so. The contribution relates to the processing of data solely within the computer and whilst the program generates an output each time a specified string of characters is located in the data stream there is no indication given as to the purpose of this output nor how it is subsequently to be used within or outside of the computer. Searching text for a string of characters is not to my mind a technical process and I cannot see, on the basis of the application as filed, any technical process outside of the computer which this could form part thereof.
- 28 I agree that the program would enable a complete search of the incoming data stream without the loss of data which would normally occur whilst rebuilding the tree structure off-line. However, I do not consider the way in which this is achieved i.e. by altering the steps in the process by which the tree structure is reconstructed to constitute a technical solution to a technical problem.
- 29 I do not therefore consider the invention to provide a technical contribution, and as such it would seem to fall squarely within the computer program exemption of section 1(2)(c).

Mental act

- 30 The examiner has also objected to the invention on the grounds that it constitutes a mental act. The agents main argument here is that, because the data stream is not in a human-readable form i.e. it is likely to be in the form of a series of bits and that the data rate is likely to be in excess of 10Kbits/sec, it is just not feasible for the search to be carried out by a human being and therefore cannot be considered merely a mental act. Furthermore, the number of keywords to be searched for is likely to be of the order of 10,000 and again it would be unreasonable to expect a human being to perform this type of search at anything like these speeds without error and without loss of data. However, having found the invention to be excluded as a computer program, I have no need to decide this issue.

Conclusion

- 31 In the light of my findings above, I conclude that the invention as claimed is excluded under section 1(2) because it relates to a computer program as such. Having read the specification I do not think that any saving amendment is possible. I therefore refuse the application under section 18(3).

Appeal

- 32 Under the Practice Direction to Part 52 of the Civil Procedure Rules, any Appeal must be lodged within 28 days of the receipt of this decision.

P Slater

Deputy Director acting for the Comptroller