Intellectual Property Office

BL O/145/17
27 March 2017

PATENTS ACT 1977

APPLICANT	BQR Reliability Engineering Ltd and Ariel University Research and Development Company Ltd.
ISSUE	Whether patent application GB1313714.6 complies with section 1(2)
HEARING OFFICER	Dr S Brown

DECISION

Introduction

1 This decision concerns the issue of whether the invention claimed in patent application GB1313714.6 relates to non-excluded subject matter, as required by section 1(2) of the Act. The application is entitled "Failure rate estimation from multiple failure mechanisms" and was filed on 31 July 2013. It was published on 11 February 2015 as GB 2516840.

2 The examiner has maintained throughout the examination process that the invention is excluded from patentability as a combination of a program for a computer and a mathematical method as such. The examiner also considers that the invention lacks either novelty or an inventive step on the basis of an earlier published document.

3 The applicant thus requested a hearing, which took place by telephone on 9 January 2017. The applicant was represented by Mr Allan Farber, with Mr Larry Loev (CEO of Ariel University R&D Company Ltd) also on the line. An assistant to the hearing officer, Ms Sarah Barker, was also present.

4 At the hearing it was agreed to consider only the question of whether the invention claimed related to excluded subject matter and to defer the issues of novelty and inventive step.

The Invention

5 The application relates to a computerised method for estimating the reliability of a system at normal operating conditions. The system may, for example, be a product, equipment, building construction, material, mechanical device, or network, but is not limited to this list. More specifically, the application sets out a way of more accurately estimating the reliability of a system which has multiple failure mechanisms.

6 The claims were amended on 16 July 2014. There are two independent claims: Claim 1 which relates to a computerised method for estimating the reliability of a system and claim 12 which relates to a computer-readable medium encoded with instructions for causing a processor to execute the method.

7 Claim 1, as amended, reads as follows:

> *A computerized method for estimating reliability of a system at normal operating conditions, the method comprising:*
>
> > *enabling selecting of a plurality of failure mechanisms FM_j of the system, wherein the failure mechanisms FM_j are estimated to cause failures as time events during use of the system; wherein the failure mechanisms FM_j are modeled by respective failure rate models, wherein failure rates are represented as matrix elements λ_{ij} which include respective adjustable parameters intrinsic to the failure rate models;*
> >
> > *wherein multiple test conditions TC_i are selected to accelerate the failure mechanisms FM_j, wherein batches i of the systems are tested during accelerated failure rate tests at the test conditions TC_i respectively; wherein accelerated failure data including failures of the systems and respective times of the failures are tabulated for the systems of each batch i during the accelerated failure rate tests,*
> >
> > *enabling summing the failure rates λ_{ij} over the failure mechanisms FM_j to produce total failure rates λ_i for each batch i of systems;*
> >
> > *enabling simultaneously fitting the total failure rates λ_i to the accelerated failure data to provide values of the adjustable parameters; and*
> >
> > *enabling determining of a reliability metric of the system at the normal operating conditions using the failure rate models with the values of the adjustable parameters.*

8 Claim 12 reads as follows:

> *A computer readable medium encoded with processing instructions for causing a processor to execute the method of claim 1.*

The law and its interpretation

9 The relevant parts of section 1(2) of the Patents Act read as follows:

> *1(2) It is hereby declared that the following (among other things) are not inventions for the purposes of this Act, that is to say, anything which consists of-*
>
> *(a) a discovery, scientific theory, or mathematical method*
>
> *…*

(c) a scheme, rule or method for performing a mental act, playing a game or doing business, or a program for a computer;
...
but the foregoing provision shall prevent anything from being treated as an invention for the purposes of this Act only to the extent that a patent or application for a patent relates to that thing as such.

10 In order to decide whether an invention relates to subject matter excluded by section 1(2), the Court of Appeal has said that the issue must be decided by answering the question of whether the invention reveals a technical contribution to the state of the art. In A*erotel/Macrossan*[1], the Court of Appeal reviewed the case law on the interpretation of section 1(2) and approved the following four-step approach to help decide the issue:

1) properly construe the claim;
2) identify the actual (or alleged) contribution;
3) ask whether it falls solely within the excluded subject matter;
4) check whether the actual or alleged contribution is actually technical in nature.

11 The operation of this approach is explained at paragraphs 40-48 of the judgment. 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 47 adds that a contribution which consists solely of excluded matter will not count as a technical contribution.

12 The case law in this area has been further elaborated in *Symbian*[2], *AT&T/CVON*[3] and *HTC v Apple*[4]. In particular, *AT&T/CVON* provided five helpful signposts to apply when considering whether a computer program makes a relevant technical contribution. In *HTC v Apple*, Lewison LJ reconsidered the fourth of these signposts and felt that it had been expressed too restrictively. The signposts, as modified in *HTC v Apple*, are:

i) whether the claimed technical effect has a technical effect on a process which is carried on outside the computer;
ii) whether the claimed technical effect operates at the level of the architecture of the computer; that is to say whether the effect is produced irrespective of the data being processed or the applications being run;
iii) whether the claimed technical effect results in the computer being made to operate in a new way;
iv) whether the program makes the computer a better computer in the sense of running more efficiently and effectively as a computer;
v) whether the perceived problem is overcome by the claimed invention as opposed to being merely circumvented.

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[1] Aerotel Ltd v Telco Holdings Ltd (and others) and Macrossan's Application [2006] EWCA Civ 1371
[2] Symbian Limited's Application [2008] EWCA Civ 1066
[3] AT&T Knowledge Ventures LP and CVON Innovations Limited [2009] EWHC 343
[4] HTC Europe Co Ltd v Apple Inc [2013] EWCA Civ 451

Application of the *Aerotel* test

Step 1: Properly construe the claim

13 At the hearing, Mr Farber emphasised that an important feature of the claimed invention is that it estimates the reliability of a real system, and that the reliability metric created is a real property of that system. He explained that another important feature of the invention is the fact that it considers multiple failure mechanisms, whereas prior art examples only consider a single failure mechanism.

14 In light of Mr Farber's comments, I construe the claim as being a computerised method for estimating the reliability of a real-world system at normal operating conditions by: (a) selecting a plurality of failure mechanisms with respective failure rate models which include adjustable parameters; (b) conducting accelerated failure rate testing at multiple accelerated test conditions; (c) tabulating the test results (including failures of the system and respective times of the failures); (d) fitting the failure rate models to the test results to determine the adjustable parameters; and (e) producing a reliability metric of the system at normal operating conditions using the failure rate models incorporating the adjusted parameters.

Step 2: Identify the actual (or alleged) contribution

15 This step involves determining what it is the inventor has really added to the stock of human knowledge. Mr Farber identified the contribution as being a method of more accurately estimating the reliability of real devices when multiple failure mechanisms are expected to play a role. I agree with this assessment. I note that the contribution is not to do with the hardware of the device performing the computation, as there is nothing in the application to suggest that anything but conventional computer hardware is used.

16 Mr Farber further explained, both in the skeleton argument and at the hearing, that estimated reliability is one of the most important features of any product, with direct consequences on the safe operation of a device. He provided some illustrative examples of the potential consequences of inaccurate reliability estimates (such as medical systems failing, bridges falling down, and satellites falling to earth). He also explained how it could impact on the design of future variants of the product in question.

17 I am grateful to Mr Farber for these explanations, as a result of which I can very well appreciate the important consequences of accurately determining the reliability of a device. I can also appreciate that the claimed method is clearly tethered to the real world in that it uses accelerated failure data measured by experiment. However, in this case I am not convinced that the tethering is enough, on its own, to avoid exclusion under section 1(2) – I will return to this point below.

18 In summary, the contribution is a better method for estimating the reliability of a system by using multiple failure rate models adjusted in response to real world data.

Steps 3 and 4: Ask whether the contribution falls solely within excluded subject matter and whether it is technical in nature

19 As noted above, the examiner has argued that the contribution falls solely within the excluded categories of a program for a computer and a mathematical method as such. Mr Farber disagrees, arguing that the contribution is not excluded because it has a technical effect outside of the computer. This naturally brings me to the first of the AT&T signposts, namely: does the claimed technical effect have a technical effect on a process which is carried on outside the computer?

20 Mr Farber submits that there are many examples of technical effects in the real world (i.e. outside the computer) of the improved reliability metric. The skeleton argument lists: use in product specifications to avoid over-designed products or products which do not achieve the required reliability or are unsafe; ability to more accurately predict reliability at different operating conditions; and virtual failure analysis to provide information about the relative dominance of the multiple failure mechanisms without needing to wait until after the device has failed.

21 However, I note that none of these effects feature within claim 1 and all are steps that must be taken by the user in response to the improved reliability metric. I can see no disclosure anywhere in the patent application that the computer-implemented method itself might incorporate any such steps. Rather, the invention as set out in claim 1 goes no further than production of a reliability metric. It does not utilise that reliability metric to provide any form of alert or control or to directly influence the real world in any way. Whilst the claimed invention uses real-world data, the only outcome of the current invention is an improved estimate of reliability. I thus disagree with Mr Farber, I can see no technical effect on a process outside of the computer.

22 Mr Farber also argued that he considers the reliability metric be a property which is intrinsic to the device under test. Indeed he explained that the reliability metric is an important part of the product specification when manufacturing any product. I understand what Mr Farber is saying here, however I think it important to note that the claimed invention uses models to provide an estimate, a prediction if you like (albeit one of improved accuracy over the prior art), of likely times to failure under particular operating conditions. I do not believe that such a *prediction* can be considered to be the equivalent of a measurement of an intrinsic property of a product - for example, as one might use a voltmeter to measure a voltage.

23 I believe that this is a key difference. I can envisage a patent application for a voltmeter which was entirely conventional in its physical construction and was only novel in its internal software which generated a more accurate measure of voltage based on what was input. Such a device would, I suspect, not be considered excluded as what it adds to human knowledge is a better voltmeter and voltage is an intrinsic property of a device. In contrast the contribution in this case is a system which outputs a *predicted* property of the device being investigated. It uses models, albeit adjusted in response to real-world data, to output an *estimate* of the reliability of the device. Once again I'm afraid that I disagree with Mr Farber – I do not consider that the output of the claimed method is an intrinsic property of the device being investigated. Rather it is a prediction based upon improved mathematical models running on a computer.

24 Returning to the AT&T signposts, it was agreed at the hearing that only the first and fifth signposts were relevant to this case. I will thus now turn to signpost 5: is the perceived problem overcome by the claimed invention as opposed to being merely circumvented? I agree with the points made in the skeleton argument that the problem being addressed is how to estimate reliability when multiple failure mechanisms are present. Previous methods involved a single failure model, resulting in systematic errors. I agree with Mr Farber that this problem is overcome by the claimed invention, rather than merely being circumvented. However I do not believe that this takes the contribution outside of the computer program or mathematical method exclusions. The problem solved relates to generating a better estimate of reliability. As reasoned above, I consider this a mathematical problem overcome by a computer program.

25 Mr Farber also drew my attention to the decision in *Synergy Holdings Limited's Application*[5]. In this hearing before the Comptroller, the hearing officer considered whether the task of simulating a real world process (oil-well production) using real world data is something specific and external to the computer. He decided that the fact that a process of computer-based modelling was based on real-world data was not enough to avoid the computer program exclusion. Were the user to use the mathematical method running on the computer to *design* a 'better' oil well then the hearing officer considered that this would be sufficient to avoid exclusion. Mr Farber was keen to point out that the current application does not relate to modelling (although it does use models). Whilst I accept this point, I believe that the reasoning used in *Synergy Holdings Limited's Application* remains relevant to this case. As discussed above, I can see no disclosure in the current application of the claimed invention *directly* influencing the real world in any way. I remain of the view that the use of real-world data to improve the estimate of reliability is insufficient in this case to avoid exclusion under section 1(2).

26 Finally, Mr Farber drew my attention to the EPO's decision in *Vicom*[6]. While decisions of the European Patent Office are not binding precedent in the UK, they are nonetheless persuasive. Mr Farber highlighted that processing real world data (in the form of an image) in a way which produces better data (a better image) was found to be patentable in *Vicom*. He therefore drew analogies with the current application, arguing that processing real-world data in a way which provides a better measure of the reliability of a product, with all of the safety and engineering ramifications which stem from this, should be patentable. Whilst I understand this line of argument, it remains my opinion that the outcome of the current invention is an improved *prediction* of the reliability of a device. As reasoned above, I do not consider that this constitutes a technical effect on a process outside of the computer. In my view this is clearly different from *Vicom* which outputs a better image.

27 I thus consider that the contribution falls solely within the excluded categories of a program for a computer and a mathematical method as such. Thus the invention fails step 3 of the Aerotel test. The above reasoning also answers step 4 of the test. As I cannot see a technical effect in a non-excluded field, it follows that the contribution is not technical in nature.

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[5] (BL O/057/15)

[6] Vicom Systems Inc. T 208/84 [1986]

Decision

28 I have found that the contribution made by the invention falls solely within matter excluded under section 1(2) as some combination of a program for a computer and a mathematical method as such. Having reviewed the application, I do not consider that any saving amendment is possible. I therefore refuse this application under section 18(3).

29 I will make one final remark here. At the hearing Mr Farber suggested that it would be wrong for the whole field of reliability engineering to be excluded from patentability. It is not my intention that this decision indicate that that is the case. All patent applications must be considered on a case-by-case basis and must be assessed against UK law as interpreted by precedent. In my opinion, it remains entirely possible that an application in the field of reliability engineering could meet all of the requirements for grant.

Appeal

30 Any appeal must be lodged within 28 days.

Dr S BROWN
Deputy Director, acting for the Comptroller