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(D) [X] No distribution

Datasheet for the decision of 26 January 2017

Case Number: T 0188/12 - 3.4.03

Application Number: 09710074.7

Publication Number: 2243044

IPC: G01V1/00, G06Q40/00, G06F17/00

Language of the proceedings: EN

Title of invention:
COMPUTER SYSTEM AND METHOD FOR DETERMINING THE IMPACT OF AN EARTHQUAKE EVENT

Applicant:
Swiss Reinsurance Company Ltd.

Headword:

Relevant legal provisions:
EPC Art. 56, 123(2)

Keyword:
Amendments - main request - added subject-matter (yes)
Inventive step - mixture of technical and non-technical features - auxiliary requests (no)

Decisions cited:
T 0931/95, T 0641/00

Catchword:

Europäisches Patentamt
European Patent Office
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Case Number: T 0188/12 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 26 January 2017

Appellant: (Applicant)	Swiss Reinsurance Company Ltd. Mythenquai 50/60 8022 Zürich (CH)
Representative:	Leimgruber, Fabian Alfred Rupert ThomannFischer Elisabethenstrasse 30 4010 Basel (CH)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 26 August 2011 refusing European patent application No. 09710074.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	T. M. Häusser
	T. Bokor

Summary of Facts and Submissions

I. The appeal concerns the decision of the examining division refusing the European patent application No. 09 710 074 for lack of inventive step (Article 56 EPC).

II. Reference is made to the following document:

D1: US 2008/0021659 A.

III. At the oral proceedings before the board the appellant (applicant) requested that the decision under appeal be set aside, and a patent be granted on the basis of claims 1-10 filed with letter dated 17 May 2011, as main request, or alternatively - as third auxiliary request - on the basis of claim 1 titled "Hilfsantrag 3" and filed during the oral proceedings in combination with claims 2-5 of the main request, or further alternatively - as fourth auxiliary request - on the basis of claim 1 titled "Hilfsantrag 4" and filed during the oral proceedings in combination with claims 2-5 of the main request.

During the oral proceedings the appellant declared that previous first and second auxiliary requests filed with the grounds of appeal as "Anhang A" and "Anhang B", respectively, were no longer maintained.

IV. The wording of respective independent claim 1 of the main request and the third and fourth auxiliary requests is as follows (board's labelling "(a)", "(b)", "(c)", "(d)", "(e)", and "(f)"):

Main request:

"1. A computer system (1) for determining an impact of an earthquake event, the system (1) comprising a data receiver (12) to receive via a communications network (2) from an earthquake data server (3) regional intensity data, indicative of ground shaking intensity caused at the geographic locations by an actual earthquake event, which intensity data are provided by near-realtime maps of ground motion and shaking intensity following an earthquake, characterized
(a) in that the system (1) comprises an interface module (11) to receive and store location information associated with geographic locations in a geographic area, which location information comprises at least a risk value and an associated risk type;
(b) in that the system (1) comprises a data receiver (12) to retrieve population numbers indicating the population size of said geographic locations for latitute/logitude [sic] grid cells, whereas census counts are apportioned to each grid cell based on likelihood coefficients, which are based on proximity to roads and slope and land cover and night time lights and other information;
(c) in that the systern (1) comprises an indexing module (14) to determining weighting factors for said geographic locations in said geographical area based on the respective population numbers, whereas the geographical area is divided into multiple sub-areas having different weight ranges based on regional population numbers and whereas the weighting factors are stored in a data store (10) comprising data structures representing weighting factors assigned to the geographic locations;
(d) in that the system (1) comprises a damage calculator (13) to determine an average damage expected at the geographic locations as a function of the ground shaking intensity;

(e) in that the system (1) comprises means of the indexing module (14) to determine an earthquake index indicative of the impact of the earthquake event, by adding up said damage expected at the geographic locations, the damage expected at each geographic location being weighted with said weighting factor assigned to the respective geographic location and stored in the data structures of said data store (10); and
(f) in that the system (1) comprises the index module (14) to trigger a financial instrument module (15) determining for a financial instrument associated with said geographical locations based upon the earthquake index, whereas the financial instrument module (15) is connected to the system (1)."

Third auxiliary request:

Claim 1 of the third auxiliary request differs from claim 1 of the main request in that
- the expression ", which location information comprises at least a risk value and an associated risk type" is deleted in feature (a),
- the expression ", wherein the population numbers are day-time dependent considering the actual time of the respective earthquake event" is added at the end of feature (b), and
- feature (f) is deleted.

Fourth auxiliary request:

Claim 1 of the fourth auxiliary request differs from claim 1 of the main request in that
- the expression ", which location information comprises at least a risk value and an associated risk type" is deleted in feature (a),

- the expression ", wherein the weighting factors for the geographic locations are based on day-time dependent population numbers considering the actual time on [sic] the respective earthquake event," is inserted in feature (c) after "weight ranges based on regional population numbers", and
- feature (f) is deleted.

V. The appellant argued essentially as follows:

(a) Main request - amendments

The appellant did not argue in relation to the objection - raised by the board during the oral proceedings - concerning the subject-matter of claim 1 of the main request extending beyond the content of the application as filed.

(b) Third and fourth auxiliary requests - inventive step

The inventive system was based on a cell-based split-up pattern. In order to reliably predict the earthquake impact, non-linear processes were transformed to linear processes which could be better captured by the linearly functioning modules of a computer based system. Moreover, the weighting factors allowed to take into account that earthquakes led to less damage in less populated areas than in more densely populated areas. In this manner the invention allowed the automatic determination of the earthquake impact, which relied on the correlation between the population density - an easily accessible parameter - and the corresponding damage. The relevant insights were those of technical experts such as geologists. Financial experts for estimating the damage on site were thus no

longer necessary. These arguments held in particular in view of the decisions T 931/95 and T 641/00 of the Boards of Appeal.

The weighting factors used in the system of document D1 were related to the measuring stations 31, 32, 33, ... but not to the geographic regions as in the system of the invention. Furthermore, according to the invention the weighting factors were determined first, which was not disclosed in document D1.

In addition, relying on day-time dependent population numbers as dynamical factors made the calculation more accurate and was not evident for the skilled person.

Reasons for the Decision

1. Main request - amendments

1.1 The application relates to a computer system and a method for determining the impact of an earthquake event using regional intensity data indicative of ground shaking intensity caused at geographic locations. This is achieved by adding up weighted damages over the geographic locations.

In particular, three distinct embodiments are disclosed with reference to Figures 2, 3, and 4, respectively, according to which

- the weights are based on population numbers and the damages are based on ground shaking intensity (Figure 2; page 7, line 20 - page 10, line 20),
- the weights are based on risk values and the damages are based on ground shaking intensity using preferably damage functions dependent on the risk

type associated with the respective geographic locations (Figure 3; page 11, line 1 - page 12, line 18), and

- the weights are based on ground shaking intensity and the damages are based on population numbers (Figure 4; page 12, line 19 - page 14, line 9).

1.2 In claim 1 of the main request it is specified that the claimed computer system comprises an indexing module to determine weighting factors for the geographic locations based on the respective population numbers and a damage calculator to determine an average damage expected at the geographic locations as a function of the ground shaking intensity (see point IV. above, features (c) and (d) of the claim). Hence, the claim relates to the first embodiment mentioned above.

However, in feature (a) of claim 1 of the main request it is mentioned that the claimed system also comprises an interface module to receive and store location information associated with geographic locations, which location information comprises at least a risk value and an associated risk type. This feature relates to the second embodiment mentioned above.

1.3 There is no indication in the application as filed that the first and second embodiments may be combined. Rather, they are presented as distinct embodiments in the parts of the description cited under point 1.1 above with reference to the respective Figures 2 and 3.

Moreover, each of original dependent claims 2 and 3 relating to the first embodiment and original dependent claim 4 relating to the second embodiment only refers to independent claim 1, but not to the other dependent claims; similarly for original dependent claims 8, 9,

and 14 (first embodiment) and original dependent claims 10 and 15 (second embodiment). Hence, the original claims do not disclose a combination of the features of the first and second embodiments, either.

In addition, it is not evident for the skilled person how such a combination could be achieved.

Therefore, claim 1 of the main request contains subject-matter extending beyond the content of the application as filed, contrary to the requirements of Article 123(2) EPC.

2. Third auxiliary request - inventive step

2.1 Closest state of the art

In the communication cited in the decision under appeal the examining division referred to D1 as a document disclosing a computer system for determining the financial impact of an earthquake event. The appellant argued in relation to inventive step also by reference to this document. Indeed, document D1 discloses subject-matter that is conceived for the same purpose as the claimed invention, namely for providing a computer system for determining the impact of an earthquake event, and has the most relevant technical features in common with it, as detailed below. Document D1 is therefore considered the closest state of the art.

2.2 Distinguishing features

2.2.1 Document D1 discloses (see paragraphs [0025]-[0043], [0074]-[0078], Figures 1-7 and 9) a computer system 1 for determining a regional impact of earthquake events including a data store 11 and multiple functional

modules, namely control module 10, data capturing module 12, indexing module 13, user interface module 14, pricing module 15, estimating module 16, and payout module 17. The computer system 1 is connected via a telecommunications network 2 to multiple seismological measuring stations 31, 32, 33, ... , 53, which are located in different geographical regions 3, 4, and 5. Data store 11 includes data structures and data elements representing historical earthquake events, geographic regions, and seismological measuring stations and replacement values associated with the geographical regions. The data representing a historical earthquake includes instrumental, i. e. measured intensity values for each measuring station 31, 32, 33, ... , 53. The data representing replacement values include abstract or monetary values of insured or insurable objects or abstract or monetary values relating to economic values created in the geographic region.

In a preparatory step S1 the control module 10 defines the set of geographical regions 3-5, e. g. after receiving operator instructions through a computer terminal connected to the computer system 1. The control module 10 then selects from the seismological measuring stations located in the geographical regions 3-5 the seismological measuring stations 31, 32, 33, ... , 53 that are to be associated with the geographical regions. For each of these measuring stations 31, 32, 33, ... , 53 control module 10 defines initial weighting factors u_i, which are determined based on the replacement values associated with the respective measuring stations i (see paragraphs [0030] and [0074]). In a data capturing step S2 the capturing module 12 establishes an earthquake event in data store 11 by creating and storing a respective data structure,

requests the measuring stations 31, 32, 33, ... , 53 to return the instrumental intensity values measured for the local strength of seismic motion, and receives these intensity values from the measuring stations 31, 32, 33, ... , 53 and stores them. Furthermore, data capturing module 12 assigns to each of the instrumental intensity values x_{it} measured at a measuring station i at time t the weighting factor u_i associated with the station i and a weighting factor v_i relating to the measured intensity level (see paragraphs [0031]-[0032], [0038]-[0039], [0075], and [0078]). The indexing module 13 determines for each of the defined geographical regions j at time t the regional earthquake intensity y_{jt} as an average intensity by summing over the intensity values x_{it} assigned to the respective geographical regions, weighted by the corresponding weighting factors u_i and v_i (see paragraph [0039]). Using a pre-selected payout function $f_j\{*\}$ a payout ratio β_{jt} is calculated for each geographical region j and time t. Multiplying the payout ratio β_{jt} with the regional replacement value w_j^k results in the regional loss contribution. The sum of all regional loss contributions for all geographical regions j in a market M results in the market loss index α_t^M (see paragraphs [0040] and [0043]).

2.2.2 The appellant argued that weighting factors used in the system of document D1 were related to the measuring stations rather than to the geographic regions as in the system of the invention. Furthermore, according to the invention the weighting factors were determined first, which was not disclosed in document D1.

The board notes that document D1 discloses indeed weighting factors u_i associated with the respective stations i. However, as indicated above, document D1

also discloses regional replacement values w_j^k, which are multiplied by the respective payout ratios β_{jt} in order to obtain the regional loss contributions. The regional replacement values w_j^k are therefore associated with the respective geographic regions j and can be considered as constituting the claimed weighting factors assigned to the respective geographic locations.

Furthermore, claim 1 of the third auxiliary request merely implies that the claimed computer system is arranged in such a way that the indexing module determines the earthquake index after the data receiver retrieves the population numbers, the indexing module determines the weighting factors, and the damage calculator determines the average damage expected at the geographic locations. This is due to the fact that the earthquake index is determined using the damage expected at the geographic locations and the weighting factors, which are in turn determined based on the population numbers. However, claim 1 of the third auxiliary request being a device claim does not imply the order in which the weighting factors and the average damage expected at the geographic locations are determined.

Hence, document D1 discloses, using the wording of claim 1 of the third auxiliary request, a computer system (1) for determining an impact of an earthquake event (namely the regional impact of an earthquake event), the system (1) comprising a data receiver to receive via a communications network (telecommunications network 2) from an earthquake data server regional intensity data, indicative of ground shaking intensity caused at the geographic locations by an actual earthquake event, which intensity data are

provided by near-realtime maps of ground motion and shaking intensity following an earthquake (instrumental intensity values measured for the strength of seismic motion created by an earthquake event), wherein the system (1) comprises an interface module (computer terminal connected to the computer system 1) to receive and store location information associated with geographic locations in the geographic area (namely the corresponding measuring stations i and weighting factors u_i), wherein weighting factors are stored in a data store comprising data structures representing weighting factors assigned to the geographic locations (regional replacement values w_j^k associated with the respective geographic regions j); wherein the system (1) comprises a damage calculator (indexing module 13) to determine an average damage (market loss index α_t^M) expected at the geographic locations (regions j in a market M) as a function of the ground shaking intensity; wherein the system (1) comprises means of the indexing module to determine an earthquake index (market loss index α_t^M) indicative of the impact of the earthquake event, by adding up said damage (payout ratio β_{jt} based on the regional earthquake intensity y_{jt}) expected at the geographic locations (geographic region j), the damage expected at each geographic location being weighted with said weighting factor (regional replacement values w_j^k) assigned to the respective geographic location (geographic region j) and stored in the data structures of said data store.

2.2.3 The subject-matter of claim 1 of the third auxiliary request differs from the computer system disclosed in document D1 in comprising the following features:

- the system comprises a data receiver to retrieve population numbers indicating the population size of said geographic locations for latitude/longitude

grid cells, wherein census counts are apportioned to each grid cell based on likelihood coefficients, which are based on proximity to roads and slope and land cover and night time lights and other information, wherein the population numbers are day-time dependent considering the actual time of the respective earthquake event (feature (b) as amended according to the third auxiliary request), and

- the system comprises an indexing module to determine weighting factors for said geographic locations in said geographical area based on the respective population numbers, the geographical area being divided into multiple sub-areas having different weight ranges based on regional population numbers (part of feature (c)).

2.3 Objective technical problem

2.3.1 In the examining division's communication cited in the decision under appeal it was stated that the distinguishing features of claim 1 pending at the time related to the calculation of a fictive earthquake index which did not involve technical character, the earthquake index being an economical index. The implementation of such a non-technical method was obvious for the skilled person.

2.3.2 The appellant argued that the inventive system was based on a cell-based split-up pattern. In order to reliably predict the earthquake impact, non-linear processes were transformed to linear processes which could be better captured by the linearly functioning modules of a computer based system. Moreover, the weighting factor allowed to take into account that earthquakes led to less damage in less populated areas than in more densely populated areas. In this manner

the invention allowed the automatic determination of the earthquake impact, which relied on the correlation between the population density - an easily accessible parameter - and the corresponding damage. The relevant insights were those of technical experts such as geologists. Financial experts for estimating the damage on site were thus no longer necessary.

In addition, relying on day-time dependent population numbers as dynamical factors made the calculation more accurate and was not evident for the skilled person.

2.3.3 The board notes that it is already known from document D1 - as pointed out under points 2.2.1 and 2.2.2 above - to determine regional intensities y_{jt} and corresponding payout ratios β_{jt} for geographic regions 3-5. The market loss index α_t^M is calculated by adding up the payout ratios β_{jt} weighted by the regional replacement values w_j^k. Hence, a sum of linear terms representing the contributions of different regions for determining the impact of an earthquake event is already known from document D1. This aspect of the invention is therefore not relevant for the formulation of the objective technical problem.

Moreover, the appellant's assertion that the population density is relied on because of its correlation to the expected damage is not convincing, especially since - according to the first distinguishing feature - the population numbers are day-time dependent. Such varying numbers cannot provide a measure of the damage to fixed installations. Rather, it is considered that it is intended to estimate in this manner the potential number of casualties due to the earthquake event. Further, by determining the weighting factors on the basis of the population numbers it is possible to determine the

potential financial impact due to the casualties, e. g. in view of life insurance policies. These are regarded financial and insurance-related considerations made by an insurance expert. This is in line with the specific embodiment specified in dependent claim 5 of the third auxiliary request and described on page 10, lines 17-20 of the description of the application, according to which the claimed computer system comprises a financial instrument module configured to determine for a financial instrument (e. g. financial derivative) a financial payout based on the earthquake index.

Technical problems first come into play when this concept is implemented in the system for determining the impact of an earthquake event. It is therefore the objective technical problem to implement the computer system for determining the impact of an earthquake event in such a way as to use day-time dependent population numbers from census counts for determining an earthquake index.

2.4 Obviousness

2.4.1 In the present case the relevant skilled person, who is trained in a technical field, is considered a software expert with particular knowledge of implementing systems for determining the impact of earthquakes. The skilled person receives - as part of the task information given to him when asked to provide a solution to the stated objective technical problem - knowledge of the specific population numbers to be used, for example retrievable as the publicly available LandScan™ Dataset files (see the paragraph bridging pages 7 and 8 of the description of the application). Furthermore, the skilled person would also receive the desired relation

between the population numbers and the corresponding weighting factors.

The LandScan™ Dataset comprises a worldwide population database compiled on a 30" x 30" latitude/longitude grid. Census counts are apportioned to each grid cell based on likelihood coefficients, which are based on proximity to roads, slope, land cover, night time lights, and other information. The population numbers may be day-time dependent (*ibid.*).

2.4.2 As indicated under point 2.2.1 above, the use of regional replacement values w_j^k, which can be considered as region-dependent weighting factors, is already known from document D1. It would be a straightforward task for the skilled person to adjust - in order to solve the posed problem - the computation of the weighting factors in such a way as to account for the relevant population numbers from census counts. The skilled person would merely need to apportion the population numbers of the grid cells of the LandScan™ Dataset to the geographic regions 3-5 of document D1 and use the desired relation between the population numbers and the corresponding weighting factors. This would necessarily lead to the geographic area having sub-areas having different weight ranges based on the regional population numbers.

Moreover, the measure of the damage used in document D1, namely the payout ratios β_{jt}, does not only depend on the region j but also on the time t. It would therefore be evident for the skilled person to use time-dependent weighting factors in order to account for the day-time dependent population numbers, thereby implementing the computer system in such a way as to

use day-time dependent population numbers from census counts for determining an earthquake index.

In this manner the skilled person would arrive at the claimed subject-matter without exercising any inventive activity.

2.4.3 The appellant stated that its arguments held in particular in view of the decisions T 931/95 and T 641/00 of the Boards of Appeal.

The board notes that the above assessment of inventive step is entirely in line with the reasoning in these decisions.

2.4.4 In view of the above the subject-matter of claim 1 of the third auxiliary request does not involve an inventive step (Articles 52(1) and 56 EPC).

3. Fourth auxiliary request - inventive step

In claim 1 of the fourth auxiliary request it is specified that the weighting factors for the geographic locations are based on day-time dependent population numbers considering the actual time of the respective earthquake event.

This is also implied by the wording of claim 1 of the third auxiliary request, according to which

- the population numbers are day-time dependent considering the actual time of the respective earthquake event, and
- the weighting factors for the geographic locations are based on the respective population numbers.

Claim 1 of the fourth auxiliary request corresponds therefore essentially to claim 1 of the third auxiliary request. Hence, for the reasons indicated above under point 2, the subject-matter of claim 1 of the fourth auxiliary request does not involve an inventive step (Articles 52(1) and 56 EPC), either.

4. Conclusion

Since none of the requests on file is allowable the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Eliasson

Decision electronically authenticated