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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TAE EUN CHOE, HONGLI DENG, MUN WAI LEE, and FENG GUO

Appeal 2019-001074
Application 14/252,661
Technology Center 2100

Before JAMESON LEE, JONI Y. CHANG, and JUSTIN T. ARBES, *Administrative Patent Judges.*

LEE, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to finally reject claims 1–19 and 21–26, all of the claims pending in this Application. Claim 20 has been cancelled. We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Avigilon Fortress Corporation. Appeal Br. 2.

CLAIMED SUBJECT MATTER

The invention generally pertains to video searching, including a method, device, and system for performing video searching, as well as a computer readable storage medium containing a program which, when executed, performs video searching. Spec. ¶¶ 6–33. The Specification describes that a recorded video scene may be analyzed semantically to detect objects, actions, events, and groups of events. *Id.* ¶ 68. For example, activities in a video scene may be classified into four categories: (1) basic action, (2) action, (3) event, and grouped event. *Id.* ¶ 69. A basic action can be, for example, walk, run, stop, turn, sit, bend, lift hands, etc., and an action may involve an agent interacting with an object, such as carry a box, open a door, disembark from a car, etc. *Id.* An event may be multiple agents interacting with multiple objects, and a grouped event may include a plurality of events occurring concurrently or sequentially. *Id.*

According to the Specification, videos are analyzed to determine scene elements, to recognize actions, and to extract contextual information, such as time and location, in order to detect events, and the various elements, actions, and events can be modeled using a relational graph. *Id.* ¶ 71. Figure 2 of the Specification is reproduced below:

FIG. 2

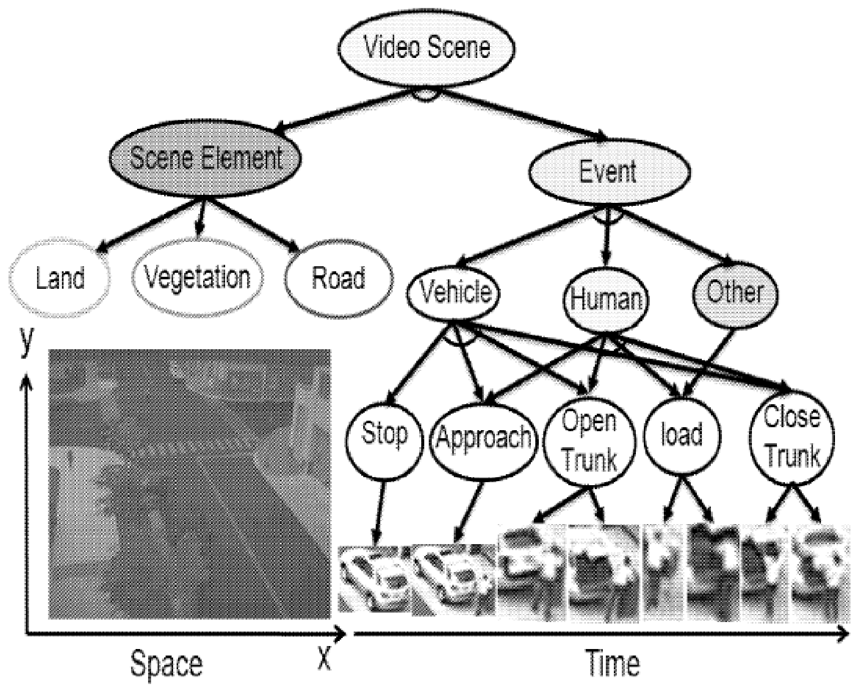

Figure 2 shows an exemplary graphical representation of a video scene including the loading of a vehicle. *Id.* ¶ 72. The Specification describes that objects, activities, and spatial and temporal relationships are represented by a parsed graph after parsing grammar of complex events. *Id.* ¶ 76.

Figure 3 of the Specification is reproduced below:

FIG. 3

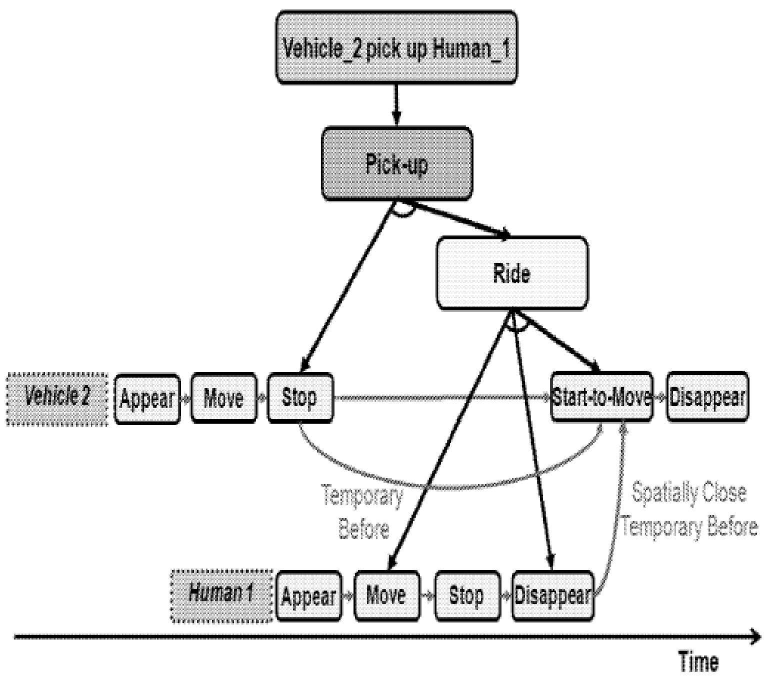

Figure 3 illustrates an exemplary parsed graph of a pickup event, where a vehicle appears in the scene and stops, a human approaches the vehicle and disappears, and then the vehicle leaves the scene. *Id.* ¶ 78.

The Specification describes that in conventional systems, a set of stored subgraphs would need to be compared with a set of subgraphs extracted from a group event of interest, and a set of subgraphs including p subgraphs is referred to as having p variables and being p-dimensional. *Id.* ¶ 84. The invention here, according to the Specification, performs "dimension reduction." *Id.* ¶ 85. The Specification defines "dimension reduction" as follows: "Dimension reduction can be described as converting a first set of p variables to a second set of k variables, where k and p are integers and k<p, each variable of the second set being derived from plural variables of the first set." *Id.*

Claims 1, 12, 15, 17, 21, 25, and 26 are independent. Each of claims 1, 12, 17, 21, 25, and 26 refers to performing dimension reduction. Claim 15 does not. However, claim 15 effectively requires performing dimension reduction, as defined in the Specification. It recites maintaining a first relational graph including M subgraphs and extracting and indexing a first set of subgraphs, and forming a plurality of N subgraph groupings, each one including a plurality of subgraphs of the first set of subgraphs, where N<M.

Representative claims 1 and 15 are reproduced below:

1. A method of performing video searching, comprising:

maintaining a storage of a plurality of grouped events in the form of a plurality of corresponding relational graphs, each relational graph having a number of subgraphs;

for at least a first grouped event having a corresponding first relational graph, extracting and indexing a first set of subgraphs including a plurality of subgraphs, the first set of subgraphs including at least one subgraph having at least 1 node;

performing dimension reduction for the first grouped event to form a plurality of subgraph groupings, each subgraph grouping including a plurality of subgraphs of the first set of subgraphs;

receiving a search request for a video search, the search request for a portion of a video that includes at least a second grouped event; and

based on the plurality of subgraph groupings, determining that the second grouped event matches the first grouped event.

15. A method of performing video searching, comprising:

maintaining a storage of a plurality of relational graphs including at least a first relational graph, the first relational graph corresponding to a first event in a video and having a number of subgraphs of M;

for at least a first event having a corresponding first relational graph, extracting and indexing a first set of subgraphs including a plurality of subgraphs, the first set of subgraphs including at least one subgraph having an order of 2;

forming a plurality of N subgraph groupings, each subgraph grouping including a plurality of subgraphs of the first set of subgraphs, wherein N is less than M;

receiving a search request for a video search, the search request for a portion of a video that includes at least a second event; and

based on the plurality of subgraph groupings, determining that the second event matches the first event.

REFERENCES

Cobb	US Pat. Pub. 2010/0061624 A1	Mar. 11, 2010
Li	US Pat. Pub. 2011/0078159 A1	Mar. 31, 2011

C. Aggarwal & Haixun Wang, *On Dimensionality Reduction of Massive Graphs for Indexing and Retrieval*, ICDE Conference (2011) ("Aggarwal")

REJECTIONS[2]

A. Claims 1, 2, 7–9, 11–13, 15–19, 25, and 26 stand finally rejected under 35 U.S.C. § 103 as obvious over Cobb and Aggarwal.

B. Claims 3–6, 10, 14, and 21–24 stand finally rejected under 35 U.S.C. § 103 as obvious over Cobb, Aggarwal, and Li.

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[2] A final rejection of claims 1–19 and 21–26 under 35 U.S.C. § 101 as being directed to patent ineligible subject matter has been withdrawn. Ans. 3.

OPINION

A. The Obviousness Rejection of Claims 1, 2, 7–9, 11–13, 15–19, 25, and 26 over Cobb and Aggarwal

1. Claim 1

According to Appellant, claim 1 recites two limitations which the Examiner acknowledges are not disclosed in Cobb but relies on Aggarwal to meet, i.e., (1) for at least a first grouped event having a first corresponding relational graph, extracting and indexing a first set of subgraphs including a plurality of subgraphs, the first set of subgraphs including at least one subgraph having at least one node; and (2) performing dimension reduction for the first grouped event to form a plurality of subgraph groupings, each subgraph grouping including a plurality of subgraphs of the first set of subgraphs. Appeal Br. 18. That is the Examiner's position. Final Act. 18–19.

Appellant argues that Aggarwal teaches the opposite, that "Aggarwal teaches performing dimension reduction first (Section II, subsection A-C), and then discusses 'Indexing with the Reduced Representation' (Section II, subsection D)." Appeal Br. 18–19 (footnote omitted). The argument is misplaced. Claim 1 does not require dimension reduction to be performed on the extracted and indexed set of subgraphs. Rather, dimension reduction is recited simply as "for the first grouped event." We do not see anything in the claim language that would preclude dimension reduction by acting on the relational graph corresponding to the grouped event prior to the subgraphs being extracted and indexed. Indeed, the claim does not use temporal words, such as "then" or "thereafter." Thus, the argument shows no error in the Examiner's rejection.

Appellant makes a further argument as follows:

> Further regarding item (2) above, the Final Office Action asserts that Aggarwal discloses "performing dimension reduction for the first grouped event to form a plurality of subgraph groupings, each subgraph grouping including a plurality of subgraphs of the first set of subgraphs," pointing to page 1092, lines 21-23 and 29-31 and Section II of Aggarwal as disclosing the claim recitations missing from Cobb. Though these sections of Aggarwal may disclose graphs, as well as dimension reduction, Appellant does not see how these sections disclose the above-recited subject matter of claim 1. The only explanation appearing the claim rejection of the Final Office Action is "a subgraph has to include at least one node in order to be a graph or to exist." *See* Final Office Action at p. 15. Appellant does not see how this statement is relevant, and this statement fails to explain how or where Aggarwal discloses forming a plurality of subgraph groupings.
>
> The "Response to Arguments" section of the Final Office Action, at p. 34, explains that "the dimension reduction process groups the nodes by looking for similar edges. This process performs the subgraph groupings." Appellant does not agree that "looking for similar edges" meets the claim limitation of forming a subgraph grouping. Aggarwal does not disclose performing dimension reduction for an event to form a ***plurality*** of subgraph groupings.

Appeal Br. 19. The issue is whether the Examiner has shown that Aggarwal discloses forming a plurality of subgraph groupings from the subgraphs of the first grouped event. For reasons discussed below, we agree with Appellant that the Examiner has not adequately made such a showing, i.e., Aggarwal forming a plurality of "subgraph groupings" of the subgraphs from which a grouped event is constituted.

The initial burden is on the Examiner to present a prima facie case of unpatentability, e.g., show where in Aggarwal is the purported teaching of forming subgraph groupings from the subgraphs representing the first grouped event. *See In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). In the Final Office Action, the Examiner refers to Aggarwal as grouping nodes by "looking for similar edges." Final Act. 34. The Examiner, however, provides inadequate citation to where such disclosure in Aggarwal can be found.

The Examiner states:

> Aggarwal teaches performing dimension reduction for the first grouped event to form a plurality of subgraph groupings, each subgraph grouping including a plurality of subgraphs of the first set of subgraphs (page 1092, lines 21–23 and 29–31 and Section II. Dimensionality Reduction of Massive Graphs, subsections A–C starting on page 1092). The dimension reduction process groups the nodes by looking for similar edges. This process performs the subgraph groupings.

Final Act. 34; *see also* Ans. 5 (citing the same portions of Aggarwal as disclosing "nodes being grouped by looking for similar edges").

We have reviewed page 1092, lines 21–23 and 29–31 (both columns), of Aggarwal. We find nothing there that supports the Examiner's assertion regarding formation of subgraph groupings, not by grouping nodes and not by grouping similar edges. If something does support the Examiner's finding, how it does so is not adequately explained by the Examiner.

As for the citation to Subsections A–C of Section II of Aggarwal, it is to nearly the entire disclosure between Aggarwal's Introduction Section I and Experimental Results Section III (four pages of single-spaced text). What immediately follows Section III is Aggarwal's Conclusions and Summary Section IV. What the Examiner effectively has done is to refer to the primary section of Aggarwal and represent that the pertinent disclosure that meets the claim limitation is there, without identifying either the specific disclosure or the location thereof. Such conclusory determination without more detailed explanation and citation is not sufficient to satisfy the Examiner's initial burden.

Without identification by the Examiner of the location of pertinent disclosure, we are unable to ascertain what exactly in Aggarwal is being identified as allegedly teaching the dimension reduction limitation. For instance, we do not find any instance where Aggarwal expressly refers to looking or searching for "similar edges." Moreover, even assuming that Aggarwal discloses "looking for similar edges," that does not mean Aggarwal discloses grouping subgraphs. It may be that Aggarwal discloses keeping only similar edges and discarding the rest. The Examiner has not explained why looking for similar edges necessarily results in formation of a plurality of subgraph groupings. Appellant also correctly notes (Appeal Br. 19) that even if Aggarwal forms a single group of nodes having similar edges, that does not satisfy the claim limitation requiring the formation of a plurality of subgraph groupings.

The Examiner has not explained sufficiently what is disclosed by Aggarwal or adequately identified where such alleged disclosure exists in Aggarwal. We have been led to no particular disclosure of Aggarwal to verify the Examiner's assertions and conclusions. Accordingly, the Examiner has failed to meet her burden to identify pertinent disclosure in Aggarwal that satisfies the claim limitation of "performing dimension reduction for the first grouped event to form a plurality of subgraph groupings, each subgraph grouping including a plurality of subgraphs of the first set of subgraphs."

For the foregoing reasons, the rejection of claim 1 as obvious over Cobb and Aggarwal cannot be sustained.

2. Claims 2, 7–9 and 11

Claims 2, 7, 8, and 11 each depend directly from claim 1. Claim 9 depends from claim 8. Thus, each of claims 2, 7–9, and 11 incorporates all of the limitations of claim 1. The deficiency of the Examiner's application of Cobb and Aggarwal as discussed above, in the context of independent claim 1, carries through to each of claims 2, 7–9, and 11. Consequently, the rejection of claims 2, 7–9, and 11 as obvious over Cobb and Aggarwal also cannot be sustained.

3. Claims 12 and 13

Similar to claim 1, claim 12 requires "extracting and indexing a first set of subgraphs for the first grouped event based on the first relational graph," and "performing dimension reduction for the first grouped event to form a plurality of first subgraph groupings, each first subgraph grouping including a plurality of subgraphs of the first set of subgraphs." As it has argued for claim 1, Appellant asserts that claim 12 requires doing the extracting and indexing first, and then the dimension reduction. Appeal Br. 23. For the same reasons we rejected that argument in the context of claim 1, discussed above, the argument is without merit.

Appellant argues, however, that the Examiner rejected claim 12 using the same inadequate reasoning that was used to reject claim 1 based on Cobb and Aggarwal. *Id.* at 22. That is true, at least with regard to the dimension reduction step mentioned above. Final Act. 18–19. Again, the Examiner relies on and cites to page 1092, lines 21–23 and 29–31, and Section II of Aggarwal. *Id.* at 19. For the same reasons such reliance on and citation to Aggarwal are deficient in the context of claim 1, as discussed above, they are deficient in the context of claim 12 as well.

Claim 13 depends from claim 12. The deficiency of the Examiner's analysis for claim 12 carries through to claim 13.

Accordingly, the rejection of claims 12 and 13 as obvious over Cobb and Aggarwal cannot be sustained.

4. Claims 15 and 16

Although claim 15 does not expressly recite "dimension reduction" as do claims 1 and 12, claim 15 recites essentially what constitutes dimension reduction: "forming a plurality of N subgraph groupings, each subgraph grouping including a plurality of subgraphs of the first set of subgraphs, wherein N is less than M."[3] As it has argued for claim 1, Appellant asserts that claim 15 requires doing the extracting and indexing first, and then the dimension reduction. Appeal Br. 25. For the same reasons we rejected that argument in the context of claim 1, the argument is without merit.

More importantly, similar to claims 1 and 12, claim 15 recites "forming a plurality of N subgraph groupings, each subgroup grouping including a plurality of subgraphs of the first set of subgraphs." Appellant argues that the Examiner accounted for this limitation the same way she accounted a similar limitation in claim 1. *Id.* at 24–25. That is true. *See* Final Act. 21. Again, the Examiner relies on and cites to page 1092, lines 21–23 and 29–31, and Section II of Aggarwal. *Id.* For the same reasons such reliance on and citation to Aggarwal are deficient in the context of claim 1, as discussed above, they are deficient in the context of claim 15.

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[3] According to claim 15, "M" is the number of subgraphs within a relational graph corresponding to a first event in a video.

Claim 16 depends from claim 15. The deficiency of the Examiner's analysis for claim 15 carries through to claim 16.

Accordingly, the rejection of claims 15 and 16 as obvious over Cobb and Aggarwal cannot be sustained.

5. Claims 17, 18, and 19

Similar to claim 1, claim 17 requires "for at least a first relational graph corresponding to a first set of related information, extracting and indexing a first set of subgraphs including a plurality of subgraphs," and "performing dimension reduction for the first relational graph to form k variables derived from the p subgraphs, k being an integer less than p." As it has argued for claim 1, Appellant asserts that claim 17 requires doing the extracting and indexing first, and then the dimension reduction. Appeal Br. 26. For the same reasons we rejected that argument in the context of claim 1, discussed above, the argument is without merit.

Appellant asserts that contrary to the Examiner's position, Aggarwal does not teach the claimed dimension reduction step. Appeal Br. 26. For that limitation, the Examiner relied on the same reasoning that was used to reject claim 1 based on Cobb and Aggarwal. Final Act. 22–23. Again, the Examiner relies on and cites to page 1092, lines 21–23 and 29–31, and Section II of Aggarwal. *Id.* at 23. For slightly different reasons such reliance on and citation to Aggarwal are deficient in the context of claim 1, as discussed above, they are deficient in the context of claim 17.

Unlike claim 1, claim 17 in its dimension reduction step requires no formation of subgraph groupings. It only requires the formation of k variables derived from the p subgraphs, where $k<p$. In the context of the Specification, a variable may be, but does not have to be, a subgraph

grouping. Spec. ¶ 23. A variable can be only a subgraph. *Id.* ¶ 84. Thus, our analysis in the context of claim 1 regarding inadequate accounting by the Examiner with regard to formation of subgraph groupings does not apply. However, because the Examiner's reliance on and citation to page 1092, lines 21–23 and 29–31, and Section II of Aggarwal, is without any meaningful specificity with regard to what actually is disclosed, we likewise cannot determine whether the cited evidence supports the Examiner's conclusion that these two steps of claim 17 are met by Aggarwal. For instance, with regard to the dimension reduction step, the Examiner states only: "(see page 1092, lines 21–23 and 29–31 and Section II, Dimensionality Reduction of Massive Graphs, subsections A–C starting on page 1092 — a subgraph has to include at least one node in order to be a graph or to exist)." Final Act. 23.

We have reviewed page 1092, lines 21–23 and 29–31 (both columns), of Aggarwal. We find nothing there that supports the Examiner's conclusion with regard to the dimension reduction step of claim 17. If something does support the Examiner's finding, how it does so is not adequately explained by the Examiner. As for the citation to Subsections A–C of Section II of Aggarwal, it is to nearly the entire disclosure between Aggarwal's Introduction Section I and Experimental Results Section III (four pages of single-spaced text). What follows Section III is Aggarwal's Conclusions and Summary Section IV. What the Examiner effectively has done is to refer to the primary section of Aggarwal and represent that the pertinent disclosure that meets the claim limitation is there, without identifying either the specific disclosure or the location thereof. Such conclusory determination without more detailed explanation and citation is not sufficient to satisfy the Examiner's initial burden. In that regard, the Examiner has not presented a position regarding Aggarwal sufficiently meaningful for review.

Claim 18 depends from claim 17. With respect to claim 17, claim 18 adds that "the k variables comprise k subgraph groupings, each subgraph grouping including a group of subgraphs from the p subgraphs." The Examiner cites to Section II.D of Aggarwal as disclosing this limitation. Final Act. 23. As explained above, we have reviewed Section II.D of Aggarwal and do not find that it discloses the formation of subgraph groupings. Further, the deficiency of the Examiner's analysis discussed above with regard to independent claim 17 carries through to claim 18.

Claim 19 depends from claim 18, which depends from claim 17. Thus, the deficiencies discussed above with regard to claims 17 and 18 carry through to claim 19.

For the foregoing reasons, the rejection of claims 17–19 as obvious over Cobb and Aggarwal cannot be sustained.

6. Claims 25 and 26

Each of claims 25 and 26 is independent. Appellant appeals from the final rejection of claims 25 and 26 and asserts that the rejection of claims 25 and 26 as obvious over Cobb and Aggarwal cannot stand because "the combined references [do not] teach and render obvious these claims." Appeal Br. 17–18.

Claim 25 is directed to "[a] non-transitory, tangible, computer readable storage medium comprising a program that when executed by a computer system performs a method." The method includes all of the steps recited in claim 1, except that where claim 1 recites "maintaining a storage of a plurality of grouped events in the form of a plurality of corresponding relational graphs, each relational graph having a number of subgraphs," claim 25 recites "storing a plurality of grouped events in the form of a plurality of corresponding relational graphs, each relational graph having a number of subgraphs." "Storing," on the one hand, and "maintaining a storage," on the other, amount to no substantive distinction with respect to how the Examiner has applied the prior art. *See* Final Act. 13–15, 25–26.

Consequently, the deficiencies of the rejection discussed above with respect to claim 1 also apply to claim 25.

Claim 26 is directed to a computer system comprising "a non-transitory, tangible, computer readable storage medium" and a "processor." Claim 26 further recites a program stored in the computer readable storage medium, which when executed by the processor, performs a method. The method includes all of the steps recited in claim 1, except that where claim 1 recites "maintaining a storage of a plurality of grouped events in the form of a plurality of corresponding relational graphs, each relational graph having a number of subgraphs," claim 26 recites "storing a plurality of grouped events in the form of a plurality of corresponding relational graphs, each relational graph having a number of subgraphs." "Storing," on the one hand, and "maintaining a storage," on the other, amount to no substantive distinction with respect to how the Examiner has applied the prior art. *See* Final Act. 13–15, 26–28.

Consequently, the deficiencies of the rejection discussed above with respect to claim 1 also apply to claim 26.

For the foregoing reasons, the rejection of claims 25 and 26 as obvious over Cobb and Aggarwal cannot be sustained.

B. The Obviousness Rejection of Claims 3–6, 10, 14, and 21–24 as Obvious over Cobb, Aggarwal, and Li

Each of claims 3–6 and 10 depends, directly or indirectly, from claim 1. Claim 14 depends from claim 12. Thus, the deficiency of the Examiner's analysis of claim 1 as obvious over Cobb and Aggarwal carries over to each of claims 3–6 and 9, and the deficiency of the Examiner's analysis of claim 12 as obvious over Cobb and Aggarwal carries over to claim 14. The reference Li, as applied by the Examiner, does not cure the deficiencies.

Similar to independent claim 17 discussed above, independent claim 21 recites "obtaining p subgraphs from the plurality of relational graphs, where p is an integer greater than 1, the p subgraphs forming portions of the relational graphs, at least some of the p subgraphs comprising at least two nodes of the relational graphs and an edge therebetween," and "performing dimension reduction on the plurality of p subgraphs to obtain a vector of k elements for each of the videos, k being an integer less than p." The Examiner relies on the same cited portions of Aggarwal, noted and discussed above in the context of claim 17 (Final Act. 23), as allegedly teaching the recited dimension reduction. Final Act. 32. We do not find those unexplained citations sufficient for the reasons explained above.

Accordingly, the rejection of claims 3–6, 10, 14, and 21–24 as obvious over Cobb, Aggarwal, and Li cannot be sustained.

CONCLUSION

In summary:

Claims Rejected	**35 U.S.C. §**	**Basis**	**Affirmed**	**Reversed**
1, 2, 7–9, 11–13, 15–19, 25, 26	103	Cobb, Aggarwal	none	1, 2, 7–9, 11–13, 15–19, 25, 26
3–6, 10, 14, 21–24	103	Cobb, Aggarwal, Li	none	3–6, 10, 14. 21–24
Overall Outcome			none	1–19, 21–26

REVERSED