

Who's in the driver's seat?

Network Patent Analysis (NPA) is used to provide a unique perspective on allegations that Toyota's hybrid cars may be infringing patents belonging to the University of California.

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What can NPA tell us about Toyota's latest hybrid car litigation?

In a nutshell

Network Patent Analysis (NPA) is a novel method of analysing the relative strength of patents using the wealth of information in the citation relationship between patents. In this short paper *we demonstrate the ability of NPA to analyse patent disputes* by reviewing the citation relationships between patents lying at the heart of allegations that Toyota's hybrid cars may be infringing patents belonging to the University of California.

Round two begins

Toyota is back in court – defending itself against a claim that their innovative hybrid cars such as the Toyota Prius and some Camry and Lexus models infringe patents belonging to the University of California (UCLA). Toyota has previously been involved in litigation with US-based Paice Corporation, settling all outstanding matters in 2010. However, Toyota has just taken the pre-emptive action of filing suit in California defending itself against litigation from US-based Efficient Drivetrains (ED), which claims to hold an exclusive licence for the five UCLA patents being asserted. Toyota is seeking a declaratory judgment of non-infringement of these patents.

The earlier Paice-Toyota litigation first came to the attention of Griffith Hack and its patent analysis partner Ambercite in a 2009 White Paper on hybrid cars, which we updated in 2011. Griffith Hack and Ambercite analysed more than 58,000 hybrid car patents as a demonstration of the power of the innovative Network Patent Analysis (NPA) technique developed by Doris Spielthener of Ambercite.

NPA has the unique ability to both group and rank patents based on a highly advanced analysis of patent citation data that helps connect these patents. In this particular study, Paice patents ended up being ranked 1st, 2nd, 4th and 7th of the 58,000 patents, ahead of the highest ranked patents from auto makers Toyota (highest ranked patent in 6th position), Ford (8th) and Honda (9th).

We also showed how the 2nd highest ranked Paice patent had forward citation connections to highly ranked Toyota patents (or, later Toyota patents citing Paice patents), suggesting an infringement risk for Toyota if they were using the inventions claimed in these patents. This observation was consistent with the successful assertion of this patent by Paice. Paice subsequently launched litigation against Ford, which was settled soon afterwards and again was consistent with what our analysis had shown.

Given the above experience, we were interested to see what the hybrid car patent data could tell us about this latest round of hybrid car litigation. We investigated this in two ways: firstly, we investigated the number and strength of forward citation linkages between the five UCLA patents being asserted against Toyota, using the hybrid car patent data we compiled in 2009. We investigated the 'quality' of these forward citation linkages using the innovative capability of NPA to calculate the 'citation relationship strength' for any citation linkage (not all citation linkages are equal in NPA analyses). As shown on page 2, it transpired that only three of the five University of California patents had forward citation linkages to Toyota patents.

Secondly, we investigated potential invalidity risks for the three UCLA patents with the forward citation connections to Toyota patents, based on prior art patents that are strongly connected to these three patents. >

About NPA, Ambercite and Griffith Hack

Network Patent Analysis (NPA) applies the wealth of information in patent citation data to group and rank patents, and provides a numerical analysis of patent litigation. NPA is being developed by patent analysts Ambercite, in conjunction with IP firm Griffith Hack, both based in Melbourne, Australia.

Neither Griffith Hack nor Ambercite have acted for any companies in relation to the US hybrid car litigation.

Does Efficient Drivetrains have a case against Toyota?

The results of the UCLA/Toyota forward citation analysis are shown in Figure 1. This shows how the five UCLA patents connect to 13 Toyota patents. The filing year for each patent and NPA hybrid car patent ranking (lower the better) is given for each patent. We also show the 'citation relationship strength' for each forward citation as calculated by NPA. A higher citation relationship strength indicates a greater likelihood of patents covering a similar invention.

Figure 1 shows that:

- All five UCLA patents had a relatively good patent ranking, being in the leading 1000 patents (out of the 58,000 patents we reviewed).
- The highest ranked UCLA hybrid car

patent, patent (a) [US6054844], which claims a method of governing the internal combustion engine in a hybrid car, was at position #35, an excellent result out of 58,000 patents.

- However, the UCLA hybrid patent with the strongest forward citation connections to Toyota patents was patent (a) [US5842534], which claims a method of governing the supplementary electric motor in a hybrid car, and was at position #310. This was connected to 10 Toyota patents.
- The highest ranked of these connected Toyota patents had an overall NPA ranking of 234 (and was the 46th highest ranked Toyota patent).
- Of these 10 forward citation connections to Toyota patents, the strongest connection was to Toyota's

US patent 6334498, which claims a transmission configuration for a hybrid vehicle.

So, in summary, NPA does suggest that ED might have the basis of a claim against Toyota, providing that Toyota is applying the technology of those patents with the strongest citation relationships to the five UCLA patents.

It should be noted that this data is almost two years old, and so may be slightly out-of-date. If there have been changes in the last two years, these may increase the strength of the citation relationship, and might add in one or two further forward citations. However, we would not expect these changes to be dramatic, as many of the key patents were filed and granted some years ago. >

Figure 1: Forward citation relationship between the UCLA hybrid car patents being asserted against Toyota, and Toyota hybrid car patents.

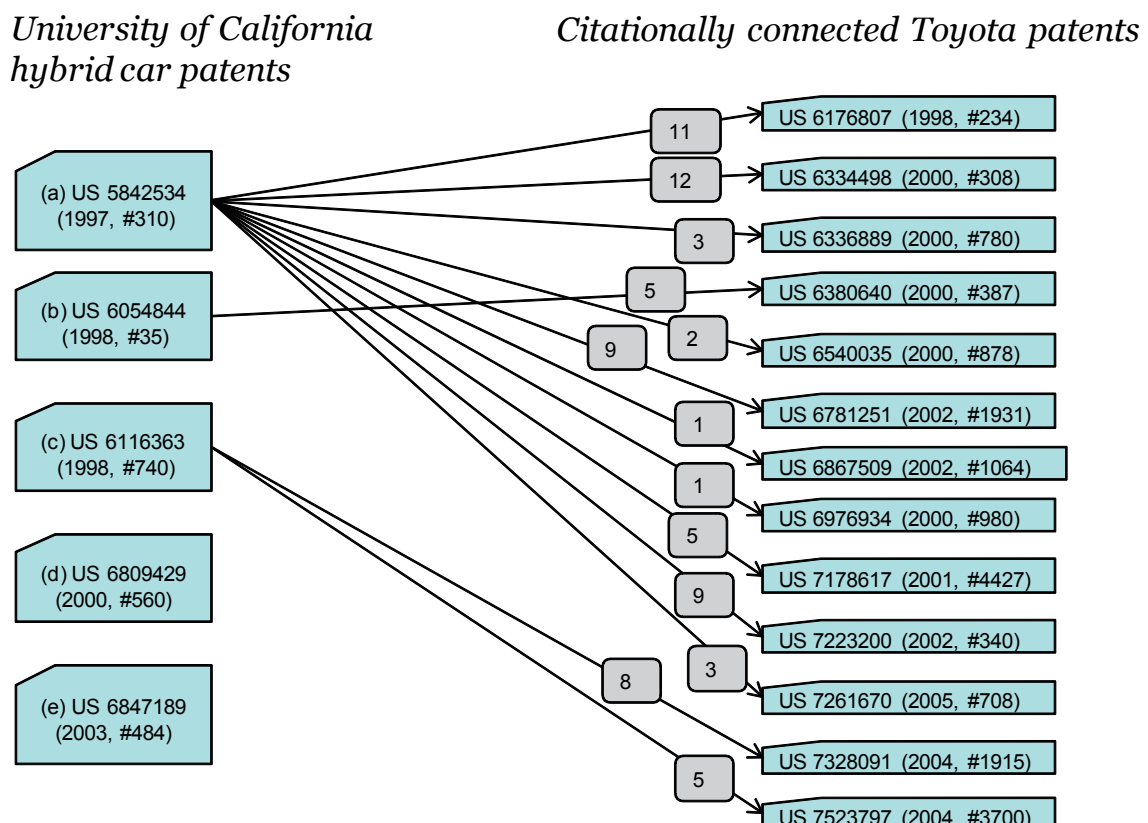


Table 1: Top five prior art patents (strongest citation relationship strength) for each of the three UCLA patents with forward citation connections to Toyota patents.

(a) US5842534		(b) US6054844		(c) US6116363	
<i>Prior art patent (published applicant)</i>	<i>Citation relationship strength</i>	<i>Prior art patent (published applicant)</i>	<i>Citation relationship strength</i>	<i>Prior art patent (published applicant)</i>	<i>Citation relationship strength</i>
US5343970 (Paice Corporation)	45	US5345154 (General Electric)	30	US5343970 (Paice Corporation)	46
US4335429 (Daihatsu)	36	US5806617 (Equos Research)	27	US4335429 (Daihatsu)	38
US4533011 (Volkswagen)	28	US5841201 (Toyota)	26	US4042056 (Automobile Corp. Of America)	19
US4042056 (Automobile Corp. Of America)	24	US5327987 (Abdelmalek, Fawzy)	25	US4269280 (Rosen, Charles)	19
US4923025 (Ellers, Clarence)	22	US5789882 (Toyota)	25	US4533011 (Volkswagen)	19



“NPA can provide solid business insight even if your technical knowledge is incomplete”
Doris Spielthener, Ambercite

How might Toyota defend itself?

People being threatened with patent infringement lawsuits normally have two main options to defend themselves, namely:

- a) proving the patent(s) in question do not apply to their products, and;
- b) proving that the patents should never have been granted in the first place.

NPA can help defendants invalidate earlier patents. NPA does this by identifying the earlier prior art patents with the strongest citation relationships to the patent being investigated.

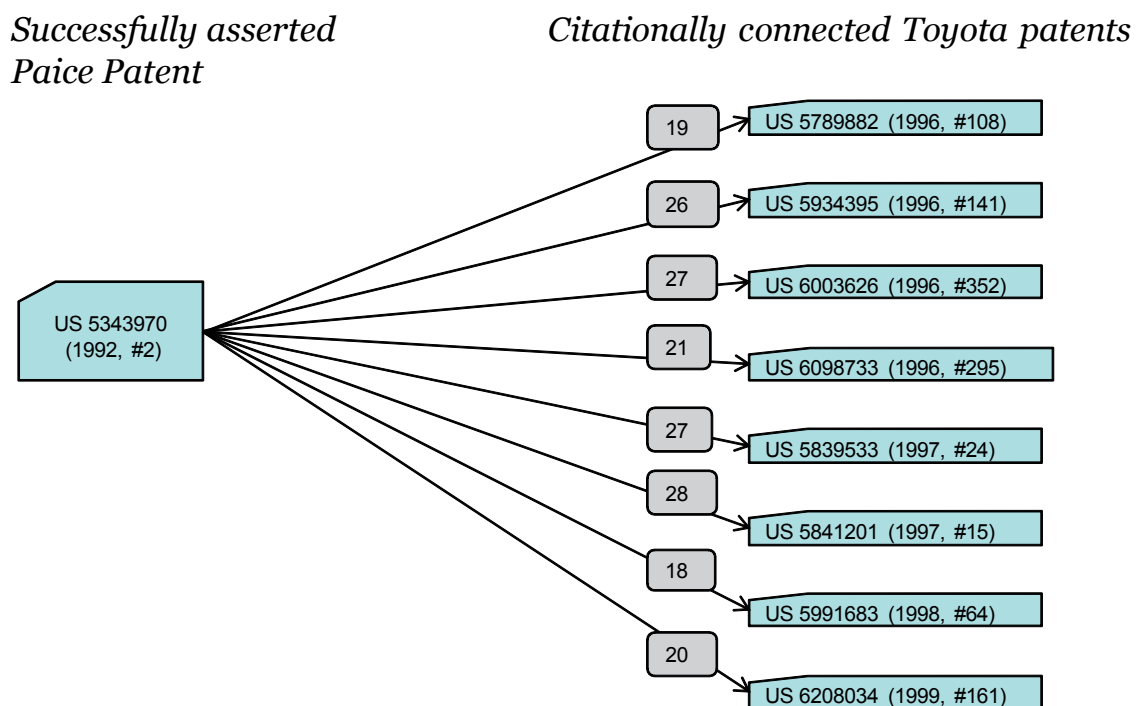
Table 1 lists the five prior art patents with the strongest citation relationships to each of the three UCLA patents with forward citation links to Toyota patents. As can be seen, US patent 5343970 to Paice Corporation is the prior art

document that Toyota’s lawyers might want to study first to see if this could invalidate two of these UCLA patents. Toyota’s lawyers will be very familiar with this patent, as this was the patent that was successfully asserted against Toyota in the earlier litigation with Paice.

In addition, Toyota’s lawyers might also want to review other patents filed by these applicants in the hybrid car area to see whether there is anything they can use to invalidate the UCLA patents.

Comparison to the earlier Paice-Toyota litigation

Figure 2: Forward citation connections between the successfully asserted Paice patent US5343970 and Toyota patents (from the 2009 hybrid car study).



The internal company ranking of a patent is an interesting measure as it suggests how important a given patent (and its underlying technology) might be to a company

So are these relationship strength values good or bad? One way of exploring this is to compare some of these results with the earlier successful assertion of Paice patents against Toyota. To keep this comparison simple, we will just concentrate on the Paice patent US5343970 that was successfully asserted against Toyota, and not look at the unsuccessful assertions that were part of the same litigation.

The Paice patent that was successfully asserted against Toyota had a series of strong citation relationships to highly ranked Toyota patents, Figure 2.

To put these rankings into some context, these included the 4th, 5th, 13th, and 24th highest ranked Toyota

patents, as compared to the 46th highest ranked Toyota patent for the UCLA patent analysis. The internal company ranking of a patent is an interesting measure as it suggests how important a given patent (and its underlying technology) might be to a company.

In other words, the successfully asserted Paice patent was connected by strong citation relationships to what were likely to be very important Toyota patents.

Toyota was also unable to invalidate this Paice patent, despite what we imagine were its best efforts to do so.

Again, we can use NPA to suggest what may be the strongest prior art, and this, perhaps surprisingly, turns out to be two patents filed by Daihatsu, both >

Table 2: Top five prior art documents (strongest citation relationship strength) for successfully asserted US patent 5343970.

<i>Prior art patent (published assignee)</i>	<i>Citation relationship strength</i>
US4335429 (Daihatsu)	61
US4407132 (Daihatsu)	42
US3923115 (Helling, Jurgen)	40
US4533011 (Volkswagen)	37
US4042056 (Automobile Corp. Of America)	36

which claim a control system for a hybrid vehicle, see Table 2. Daihatsu patent US4335429 also made the top five prior art patents for UCLA patents a) and c).

It is of interest to note that these prior art citation relationship strength values are higher than those of the three UCLA patents being analysed, and yet Toyota was not able to invalidate this patent. Having noted this, we believe that the relationship strength of prior art citation linkages is only one indicator of the ‘strength’ (ability to survive invalidity proceedings) of a patent.

Another indicator may be the NPA patent ranking of the patent. In the latter case, the Paice patent was ranked 2nd by NPA, compared to the 310th ranking for what may be the most important UCLA patent – US patent 5842534.

Toyota was also unable to invalidate this Paice patent, despite what we imagine were its best efforts to do so. Again, we can use NPA to suggest the strongest prior art, and this, perhaps surprisingly, turns out to be two patents filed by Daihatsu



“Once again, NPA has provided a unique perspective on patent litigation”
Mike Lloyd, Griffith Hack

Key lessons

Network Patent Analysis was applied to the patents at the centre of the dispute between Efficient Drivetrains and Toyota regarding some hybrid car patents owned by the University of California (UCLA). This dispute has also been compared to an earlier hybrid car patent dispute between Toyota and Paice Corporation.

The unique ability of NPA to visualise patent disputes shows that:

1. ED has a potential claim against Toyota, assuming Toyota is applying the inventions/technology claimed in those patents connected to the University of California patents.
2. The connected Toyota patents are relatively lowly ranked, and so the inventions claimed in these patents may not be as important (or as commercialised) as the connected patents in the Paice litigation.
3. The strength of the forward citation relationships between the UCLA and Toyota hybrid car patents was only half as strong as what we determined in the successful Paice assertions.
4. Our analysis provided inconclusive indicators as to the ability of the UCLA patents to survive an invalidity attack from Toyota.

Only time will tell how successful ED will be in this litigation. Overall, NPA suggests that ED's case is not as strong as Paice's was in its successful litigation.

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