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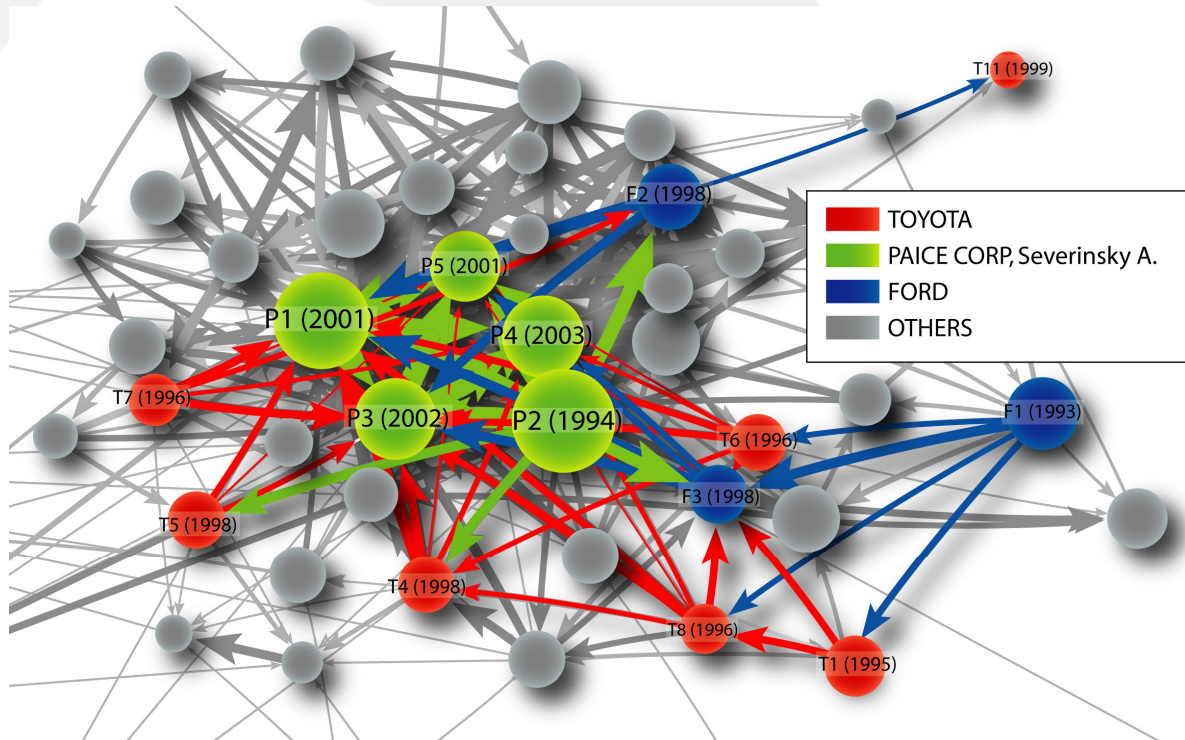
Hybrid car technologies – what can the advanced patent analysis method Network Patent Analysis (NPA) tell us about the leading companies and patents?

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Hybrid car technologies – what can an advanced patent analysis method such as Network Patent Analysis (NPA) tell us about the leading companies and patents?

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Executive Summary

Network Patent Analysis™ (NPA™) is the sophisticated analysis and mapping of patent citation data for the purposes of determining the leading patents, patent applicants and technology trends in any area of technology. In this white paper NPA is applied to the area of hybrid car patents to illuminate the key developments.

Analysing 58,000 hybrid car patents and their inter-relationships, we found that the top ranked patents were filed by the hybrid drivetrain developer Paice Corporation, ahead of patents filed by Toyota, Ford and Honda who are better known for selling hybrid vehicles. NPA was also used to illustrate the 'apparent technology flows' (or similarities between patents) into and out of the top ten patents filed by these companies. The leading Paice hybrid car patents were shown to have strong self-citation relationships with other Paice patents. This contrasts with the top ten hybrid car patents filed by Ford, which were connected via citations to a variety of companies including Paice, Toyota, and Railpower Technologies, who have developed hybrid technologies for trains. Toyota's top ten hybrid car patents showed a strong citation relationship to patents filed by Suzuki as well as Paice, who has successfully asserted one of their key patents against Toyota in relation to hybrid vehicles.

Overall, our study identified and visualised the most relevant relationships between leading patents filed by Paice, Toyota and Ford, which we found to be consistent with known litigation and patent licensing agreements between these parties, thereby helping to confirm the ability of NPA to predict potential patent assertions.

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Introduction – why analyse hybrid car patents?

Hybrid cars may end up changing the way we all drive. A hybrid car, in general terms, may be described as a car that obtains its power from two or more energy sources. Currently, the most common type of hybrid cars are those sold by Toyota, which use an electric motor to boost or completely substitute for short periods a petrol motor (known as a parallel hybrid because the engine and electric motor can work in parallel). Alternative hybrid car designs include limiting the role of the electric motor to boosting the power available from a petrol motor (Honda) or using a petrol motor simply to produce electricity for an electric motor, which directly drives the car (produced by Chevrolet, and also known as a series hybrid). In all three cases, one of the main reasons for the increased fuel efficiency of a hybrid car is that they are able to capture, and store as electric energy, the energy normally lost during braking.

General trends in hybrid car patent filings

Hybrid cars have been around since 1899, but it is only in the last 10 years that they have had significant commercial success. This history is reflected in the patent literature. While the first known hybrid car patent was filed in 1906, the number of patent filings was relatively low until around 1992, when Toyota made a public declaration to significantly reduce the fuel economy of its cars. As discussed in a 2009 Griffith Hack report on hybrid car filings, hybrid car patent filings exploded after this date, with patent filings led by Toyota, Figure 1, but supported by other Japanese car companies and Japanese suppliers to the car industry, Figure 2. By 2009 43% of the identified hybrid car patents¹ were filed by Toyota alone, in comparison to 8% filed by the US car industry and 7% by the European car industry (Figure 3). Toyota also dominated hybrid car sales in the later part of the last decade, with 77% of US hybrid car sales in 2007 and 2008 coming from Toyota or its Lexus subsidiary.

Figure 1. Summary of hybrid car patent family filing trends²

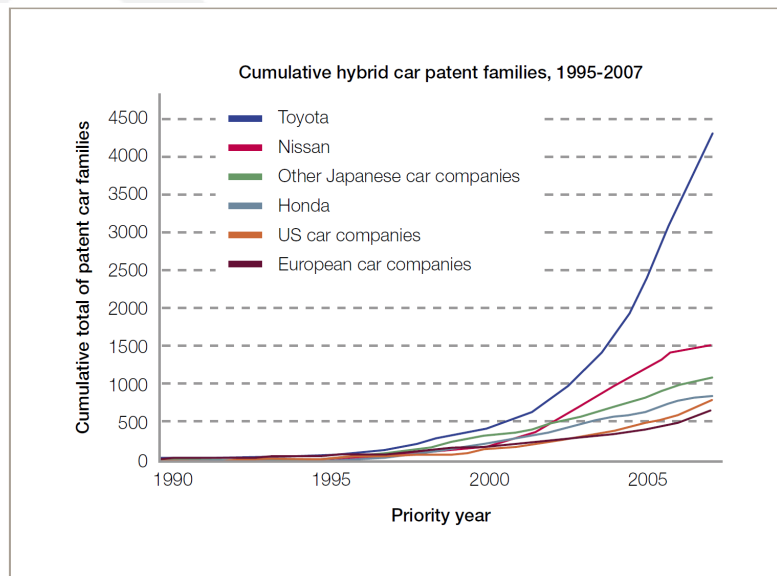
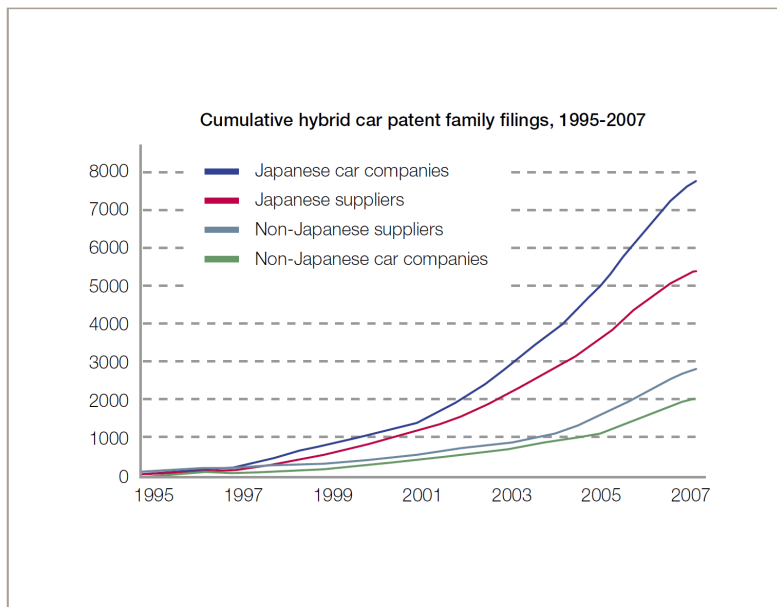


Figure 2. Car company patent filings are supported by patent filings by suppliers.



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