Sure! Here’s a more detailed summary of the article:

* **Objective**: The study aims to analyze the sound of motorcycle engines to diagnose faults using **Fast Fourier Transform (FFT)** and other signal processing techniques.
* **Methodology**: The researchers recorded engine sounds under normal and faulty conditions using a sound catcher. They then processed these sounds using **three signal features**: fundamental frequency, FFT, and 3D analysis diagrams.
* [**Findings**: Significant differences were found between the sound signals of normal and faulty engines](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C0%7Cbf204012-6f5d-4186-8cc1-a28c9f29ab7c)[1](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C0%7Cbf204012-6f5d-4186-8cc1-a28c9f29ab7c). These differences can effectively discriminate between normal and faulty engine conditions.
* **Applications**: The proposed method can be used for **predictive maintenance** of motorcycle engines, helping to identify issues early and prevent major failures.

If you need more details on any specific part, feel free to ask!

The methodology section of the paper discusses the experimental design, parameter calculation, and parameter comparison for analyzing engine sounds. Here are the key points:

* **Experimental Design**: The study involves recording engine sounds from a Honda scooter engine under normal and fault conditions. [The sounds are collected into databases for normal and fault engines, and signal parameters are calculated and compared1](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C0%7Cbba5c441-16d4-4067-b4ac-7d805ecb2ef2)[2](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C1%7Cbba5c441-16d4-4067-b4ac-7d805ecb2ef2).
* **Parameter Calculation**: The sound signals are analyzed using a heterodyne analyzer to obtain the power spectrum and cepstrum. [The analysis involves modifying the amplitude spectrum and combining it with the original phase spectrum to generate an edited time record3](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C2%7Cbba5c441-16d4-4067-b4ac-7d805ecb2ef2).
* [**Parameter Comparison**: The sound signal database is divided into normal and fault engine cases2](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C1%7Cbba5c441-16d4-4067-b4ac-7d805ecb2ef2). [The differences between the normal and fault engines are investigated using signal parameters, Fast Fourier Transform (FFT) analysis, and 3D frequency analysis4](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C3%7Cbba5c441-16d4-4067-b4ac-7d805ecb2ef2). [The study concludes that the signal parameters can effectively discriminate between normal and fault engines5](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C4%7Cbba5c441-16d4-4067-b4ac-7d805ecb2ef2)[6](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin11,udsdlpconsent,udscstart,cspgrd,&shellsig=2cd415f7047dd267696c41b94bf6cb0fd8ce1b96&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C5%7Cbba5c441-16d4-4067-b4ac-7d805ecb2ef2).