

FORM 2
THE PATENTS ACT, 1970
(39 of 1970)

And

THE PATENTS RULES, 2003
Complete Specification
(*See* Section 10 and Rule 13)

1. Title of the invention

AN AUTOMATED SYSTEM AND METHOD TO MANAGE PRODUCT FEEDBACKS

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The following specification particularly describes the invention and the manner in which it is to be performed.

**AN AUTOMATED SYSTEM AND METHOD TO MANAGE PRODUCT
FEEDBACKS**

FIELD OF THE INVENTION

[0001] The present invention relates to manage product feedbacks by users. In particular, the present invention relates to an automated system and method to manage product feedbacks.

BACKGROUND OF THE INVENTION

[0002] Typically, a plurality of electronics and electrical products are installed in a household for essential tasks of everyday life and a user may face one or more issues with the one or more products during any time of the day. The issues may include a problem that a particular user may encounter while using a product, a feature that may be missing from a product, a hardware fault, a software issue or the like. In majority of situations, the issues do not require a physical check by a technician, therefore companies provide offline support to the user via telephonic conversations and chats to solve the issues. However, such offline supports require a dedicated technician for each product or model of the company to answer user queries.

[0003] Further, a user encounters inconvenience in explaining the issues associated with the products to the technicians mainly due to lack of time or technical knowledge of the product. Consequently, the efficiency of the technicians to solve the issues is affected due to lack of information provided by the user.

Additionally, the conventional technologies do not keep track of common issues in order to form a pattern for eliminating the frequent issues in the next batch of products. Also, the conventional systems do not monitor
5 the user suggestions related to the product's features, hardware, aesthetics or the like to obtain popular features for improving the next batch of products.

[0004] Thus, there is a need for an automated system and method to manage product feedbacks to address each
10 user query and improve the quality of the products based on product feedbacks.

SUMMARY OF THE PRESENT INVENTION

[0005] In an embodiment of the present invention, an automated system to manage product feedbacks is
15 disclosed. The automated system includes one or more input modules to receive one or more inputs via one or more modes from the user, the one or more inputs are associated with user questions and feedbacks related to a product. Further, the automated system includes a
20 canonical query formation engine communicatively coupled to a microprocessor, to form a smart query based on the one or more modes of inputs by employing one or more Machine Learning (ML) models. The automated system also includes a query processing and analysis engine
25 communicatively coupled to the microprocessor having a query answering module to extract a relevant answer to the smart query from a database and a data analytics engine to classify and categorize the one or more smart

queries to provide one or more smart services based on product feedback.

[0006] In an embodiment of the present invention, the one or modes of inputs include at least one of: text, 5 speech and image associated with the product. Further, the automated system includes a conversion module having at least a speech-to-text converter to convert the speech input into text.

[0007] In an embodiment of the present invention, the canonical query formation engine further comprises a triple extraction module to extract a data entity from 10 the one or more inputs, a graph summarization module to employ one or more ML models to identify the relevance of the data entity and an intelligent query formation 15 module to form a smart query based on the extracted data entities from the one or more inputs by employing a Natural Language Generation (NLG) model to form the smart query. Further, the data entity corresponds to at least one of a subject, a predicate and an object of a data 20 entity.

[0008] In an embodiment of the present invention, the triple extraction module further includes an image processing module having an image segmentation module to extract a relevant zone from the image input associated 25 with the product, an optical character recognition to extract a text from the extracted relevant zone and a zone label value extractor to extract a value from the extracted relevant zone.

[0009] In an embodiment of the present invention, the triple extraction module further includes a text processing module having a named entity recognition module to identify a named entity from the text input,
5 a relation extraction module to extract the relation of the identified named entity and a question type classifier to identify a type of question. Further, the triple extraction module includes a triple builder to build a data entity based at least on the inputs from
10 one of: the image processing module and the text processing module.

[0010] In an embodiment of the present invention, the data analytics engine further includes an issue classifier to classify issues associated with the one or
15 more queries based at least on one of: a topic classifier and a type classifier, a feature classifier to classify one or more specific issues associated with the one or more queries and an issue registry to store the one or more issues and specific issues. Further, the data
20 analytics engine includes a statistical analysis module configured to employ one or more Machine Learning (ML) models to identify the patterns of the one or more one or more issues and the specific issues and an issue frequency counter to extract and store the frequency of
25 the one or more extracted issues.

[0011] In an embodiment of the present invention, the automated system further includes a report production module configured to generate a smart services based product feedback report based at least on the classified
30 and categorized one or more queries. Further, the

database includes a knowledge graph of a manual associated with one or more products.

[0012] An embodiment of the present invention discloses, an automated method to manage product feedbacks. The automated method includes receiving one or more inputs via one or more modes from the user, the one or more inputs are associated with user questions and feedbacks related to a product. Further, the automated method includes forming a smart query based on the one or more modes of inputs by employing one or more Machine Learning (ML) models. The automated also includes extracting a relevant answer to the smart query from a database. Thereafter, the automated method includes classifying and categorizing the one or more smart queries to provide one or more smart services based product feedbacks.

[0013] In an embodiment of the present invention, the one or modes of inputs include at least one of: text, speech and image associated with the product. Further, the automated method includes converting the speech input into text via a speech-to-text converter.

[0014] In an embodiment of the present invention, the automated method includes extracting a data entity from the one or more inputs, identifying the relevance of the data entity by employing one or more ML models and forming a smart query based on the extracted data entities from the one or more inputs by employing a Natural Language Generation (NLG) model. Further, the

data entity corresponds to at least one of: a subject, a predicate and an object of a data entity.

[0015] In an embodiment of the present invention, the automated method includes extracting a relevant zone 5 from the image input associated with the product, extracting a text from the extracted relevant zone and extracting a value from the extracted relevant zone to extract the data entity from the image input.

[0016] In an embodiment of the present invention, the 10 automated method includes identifying a named entity from the text input, extracting the relation of the identified named entity and identifying a type of question to extract the data entity from the text input. Further, the automated method includes building a data 15 entity based at least on one of: the image inputs and the text inputs.

[0017] In an embodiment of the present invention, the automated method includes classifying issues associated with the one or more queries based at least on one of: 20 a topic classifier and a type classifier. Next, extracting one or more issues associated with the one or more queries, Next, storing the one or more extracted issues and identifying the patterns of the one or more extracted issues by employing one or more Machine Learning (ML) models. Thereafter, the automated method 25 includes extracting and storing the frequency of the one or more extracted issues.

[0018] In an embodiment of the present invention, the automated method includes generating a smart

services based product feedback report based at least on the classified and categorized one or more queries. Further, the database includes a knowledge graph of a manual associated with one or more products.

5 **[0019]** Thus, the present invention provides an automated mechanism to manage product feedbacks. The automated mechanism supports multimodal inputs by the user including text, speech and image. Further, the automated mechanism takes multimodal inputs to form a
10 text query with complete information from the multimodal inputs to understand the user query efficiently. Further, the automated mechanism automatically analyzes the user issues and provides a solution to the user issues. Furthermore, the automated mechanism stores and
15 informs the production team regarding the frequent issues and popular features for improvement in the future batches of products.

BRIEF DESCRIPTION OF DRAWINGS

20 **[0020]** The following drawings are illustrative of preferred embodiments for enabling the present invention and are not intended to limit the scope of the invention. The drawings are not to scale (unless so stated) and are intended for use in conjunction with the explanations in the following detailed description.

25 **[0021]** Figure 1 illustrates an architecture diagram of an automated system to manage product feedbacks in accordance with an embodiment of the present invention;

[0022] Figure 2(a) illustrates an architecture diagram of a triple extraction module in accordance with an embodiment of the present invention;

5 **[0023]** Figure 2(b) illustrates an architecture diagram of a graph summarization module in accordance with an embodiment of the present invention;

[0024] Figure 2(c) illustrates an architecture diagram of an intelligent query formation module in accordance with an embodiment of the present invention;

10 **[0025]** Figure 3(a) illustrates an architecture diagram of a query answering module in accordance with an embodiment of the present invention;

15 **[0026]** Figure 3(b) illustrates a knowledge graph stored in the database in accordance with an exemplary embodiment of the present invention;

[0027] Figure 4(a) illustrates an architecture diagram of an issue classifier in accordance with an embodiment of the present invention;

20 **[0028]** Figure 4(b) illustrates an architecture diagram of a feature classifier in accordance with an embodiment of the present invention;

[0029] Figure 5 illustrates a block diagram of a statistical analysis module in accordance with an embodiment of the present invention;

[0030] Figure 6 illustrates an operation of the automated system to manage product feedbacks in accordance with an embodiment of the present invention;

5 **[0031]** Figure 7 illustrates an implementation of the automated system to manage product feedbacks in accordance with an exemplary embodiment of the present invention;

10 **[0032]** Figure 8 illustrates another implementation of the automated system to manage product feedbacks in accordance with another exemplary embodiment of the present invention; and

[0033] Figure 9 is a flowchart illustrating an automated method to manage product feedbacks in accordance with an embodiment of the present invention.

15 **DETAILED DESCRIPTION OF DRAWINGS**

[0034] The following disclosure is provided in order to enable a person having ordinary skill in the art to practice the invention. Exemplary embodiments are provided only for illustrative purposes and various 20 modifications will be readily apparent to persons skilled in the art. The general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the invention. Also, the terminology and phraseology used 25 are for the purpose of describing exemplary embodiments and should not be considered limiting. Thus, the present invention is to be accorded the widest scope encompassing numerous alternatives, modifications, and equivalents

consistent with the principles and features disclosed. For the purpose of clarity, details relating to technical material that is known in the technical fields related to the invention have not been described in detail so as 5 not to unnecessarily obscure the present invention.

[0035] Figure 1 illustrates an architecture diagram of an automated system 100 to manage product feedbacks in accordance with an embodiment of the present invention. In an embodiment of the present invention, 10 the product may correspond to an electronic device, an electrical device, a software, a household device or the like. Specifically, the product may, without any limitation include, a refrigerator, a television, a microwave, a washing machine, an electric iron, a 15 dishwasher, a mobile phone, a microwave oven, an air conditioner and a vacuum cleaner. Further, the product feedback may, without any limitation include, a user query associated with a product, a problem a user may encounter while using a product, a feature that may be 20 missing from a product, a hardware fault and user opinion on product aesthetics.

[0036] The product feedback may be received from a forum where a user may post one or more product feedbacks via an application. A forum may be understood as a 25 discussion platform where people ask questions, share their experiences and discuss topics of mutual interest. In an embodiment of the present invention, the application may be a mobile application, such as LG ThinQ™. In another embodiment of the present invention, 30 the application may be a web application, such as LG

Community Forum. Further, managing product feedback may correspond to one or more smart services based on product feedbacks, such as replying to user feedback, monitoring the product feedback, keeping a record of the product
5 feedback and providing frequent suggestions to the production team.

- [0037]** In an embodiment of the present invention, the automated system 100 may include one or more input modules 102, a canonical query formation engine 104, and
10 a query processing and analysis engine 106. The one or more input modules 102, the canonical query formation engine 104 and the query processing and analysis engine 106 may be communicatively coupled to a memory and a processor of the automated system 100. The memory may
15 include a database. Further, the processor may be configured to control the operations of one or more components of the one or more input modules 102, the canonical query formation engine 104 and the query processing and analysis engine 106.
- 20 **[0038]** In an embodiment of the present invention, the processor and the memory may form a part of a chipset installed in the automated system 100. In another embodiment of the present invention, the memory may be implemented as a static memory or a dynamic memory. In
25 an example, the memory may be internal to the automated system 100. In another example, the memory may be implemented as an external memory for the automated system 100. The memory may be a cloud based storage or onsite based storage. Further, the processor may be
30 implemented as one or more microprocessors,

microcomputers, microcontrollers, digital signal processors, central processing units, state machines, logic circuitries, or any devices that manipulate signals, based on operational instructions.

- 5 **[0039]** In an embodiment of the present invention, the one or more input modules 102 may be configured to receive one or more multimodal inputs from the user. The one or more inputs may correspond to product feedbacks received from the user. A multimodal input may be
10 understood as user input via more than one mode of input. In an embodiment of the present invention, the modes of inputs may include a text input, a speech input, an image input or a combination thereof. The text input may correspond to an input from the user in a textual form,
15 such as a text, an email, an article and a post. The speech input may correspond to an input from the user in an audio form, such as a call recording, an audio review of the product and an audio post. The image input may correspond to an input from the user in a graphical form,
20 such as an image of a display panel of the product, an image of the product and a hand-drawn graphic. In an embodiment of the present invention, the image input may include an image of the display panel of the product. The display panel may be configured to display an error
25 code associated with the product, model number, a written text on the panel or the like. In an embodiment of the present invention, the display may be divided into a temp zone, spin zone and mode zone.

- [0040]** In an embodiment of the present invention, the
30 canonical query formation engine 104 may be configured

to form a query based on the one or more inputs from the user. Further, the canonical query formation engine 104 may include a conversion module 108, a triple extraction module 110, a graph summarization module 112 and an
5 intelligent query formation module 114.

[0041] In an embodiment of the present invention, the conversion module 108 may be configured to convert the multimodal inputs into the text inputs. In an embodiment of the present invention, the conversion module 108 may
10 include a speech-to-text converter to convert the speech input into text. In another embodiment of the present invention, the conversion module 108 may include an Optical Character Recognition (OCR) to convert an image input into the text. In yet another embodiment of the
15 present invention, the conversion module 108 may include other software and hardware known in the art for converting the corresponding multimodal inputs into the text inputs.

[0042] Figure 2(a) illustrates an architecture diagram of a triple extraction module in accordance with an embodiment of the present invention. Figure 2(b) illustrates an architecture diagram of a graph summarization module in accordance with an embodiment of the present invention. Figure 2(c) illustrates an
20 architecture diagram of an intelligent query formation module in accordance with an embodiment of the present invention. For the sake of brevity, Figures 2(a), 2(b)
25 and Figure 2(b) have been explained together.

[0043] In an embodiment of the present invention, the triple extraction module 110 may include an image processing module 202, a text processing module 204 and a triple builder 206, as shown in Figure 2(a). Further,
5 the triple extraction module 110 may be configured to extract one or more data entities associated with a triple from the one or more inputs. The data entities may include a subject, a predicate and an object. Further, the triple may be understood as a representation
10 of a relation between subject and object in a sentence. In an embodiment of the present invention, the triple may be represented in a form of (subject-predicate-object). It may be understood that the predicate may represent the relation between the subject and the
15 object.

[0044] In an embodiment of the present invention, the image processing module 202 may include an image segmentation module 208 to extract a relevant zone from the image input associated with the product. Further,
20 the image processing module 202 may include an optical character recognition 210 to extract a text from the extracted relevant zone. The image processing module may also include a zone label value extractor 212 to extract a value from the extracted relevant zone. For instance,
25 the zone label value extractor 212 may extract values, such as "temp", "Cold", "20deg", "40deg", "60deg" and "95deg".

[0045] In an embodiment of the present invention, the text processing module 204 may include a named entity
30 recognition (NER) module 214 to identify a named entity

from the text input. The named entity recognition module 214 may utilize a Stanford NER tool, a spacy NER tool, a custom NER tool or a combination thereof to identify a named entity from the text input. Further, the named 5 entity may without any limitation include Inlet Error (IE) and Ice Plus Function.

[0046] Further, the text processing module 204 may include a relation extraction module 216 to extract the relation of the identified named entity. In an embodiment 10 of the present invention, the relation extraction module 216 may include a dependency parser 218 and an information extraction tool 220. The dependency parser 218 may be configured to parse the sentences into a parse tree to extract relations from the sentences. In an 15 embodiment of the present invention, the dependency parser 218 may utilize one or more open source tools known in the art, such as Spacy dependency and Stanford dependency. Further, the information extraction tool 220 may be configured to identify and extract binary 20 relations from the sentences. The binary relation may be understood as a relation that may be expressed as a triple (A, B, C), where A and B are arguments and C is the relation between those arguments. In an embodiment 25 of the present invention, the information extraction tool 220 may utilize one or more open source tools known in the art, such as Ollie. The text processing module 204 may also include a question type classifier 222 to identify a type of question. For instance, if the query is "How to use Ice Plus Function?", then the identified 30 type of question may be "How".

[0047] In an embodiment of the present invention, the triple builder 206 may be configured to build a triple based at least on the inputs from the image processing module 202, the text processing module 204 or a combination thereof. In an exemplary embodiment of the present invention, the triple may without any limitation include, (Topic, has_type, IE Error), (Topic, has_type, Ice Plus Function), (How to, fix, IE Error), (Query, REL, fix), (Query, question_type, how) and (Query, question_type, what).

[0048] In an embodiment of the present invention, the graph summarization module 112 may include one or more neural network layer blocks 224 and an embedding layer block 226, as shown in Figure 2(b). Further, the graph summarization module 112 may be configured to identify the relevance of the triple. The relevance of the triple may be understood as the accuracy of the triple for making a query. Further, the graph summarization module 112 may employ one or more Machine Learning (ML) models to identify the relevance of the triple. In an embodiment of the present invention, the graph summarization module 112 may take N-triples and each triple may be converted into a d-dimensional vector and may output N-scores as S₁, S₂, ..., S_n indicating the probability. The probability may indicate whether a triple is relevant by measuring a triple with a score greater than a threshold value. For instance, 10 triples may be input to the graph summarization module 112 and 6 triples may have a score greater than the threshold value, such as 0.8 on a scale of 0-1, then the rest 4 triples may be discarded.

[0049] In an embodiment of the present invention, the intelligent query formation module 114 may include one or more transformer decoder block 228 and an embedding layer block 230, as shown in Figure 2(c). Further, the 5 intelligent query formation module 114 may be configured to form a query based on the extracted triples from the one or more inputs. Further, the intelligent query formation module 114 may be configured to employ a Natural Language Generation (NLG) model to form the 10 query. In an embodiment of the present invention, the intelligent query formation module 114 may be a Generative Pre-trained (GPT) transformer to generate a natural language query using a number of selected triples from the total number of triples. At first, the triples 15 may be converted into embedding and then fed to the GPT transformer to generate a natural language query.

[0050] Figure 3(a) illustrates an architecture diagram of a query answering module 116 in accordance with an embodiment of the present invention. Figure 3(b) 20 illustrates a knowledge graph stored in the database 118 in accordance with an exemplary embodiment of the present invention. For the sake of brevity, Figures 3(a) and 3(b) have been explained together.

[0051] In an embodiment of the present invention, the 25 query processing and analysis engine 106 may include a query answering module 116, a database 118 and a data analytics engine 120. Further, the query processing and analysis engine 106 may be configured to extract a relevant answer to the query from the database 118. The 30 query processing and analysis engine 106 may also be

configured to classify and categorize the one or more queries to provide one or more smart services based on product feedback. In an embodiment of the present invention, the database 118 may include a knowledge graph 5 328 of a manual associated with one or more products, as shown in Figure 3(b).

[0052] In an embodiment of the present invention, the query answering module 116 may include a model number identifier 302 to identify the model number of the 10 product associated with the query. Further, the query answering module 116 may include a section classifier 304 to identify a section for searching the answer to the query. In an embodiment of the present invention, the section may without any limitation include, a 15 Troubleshooting Specification (TS) section, a Frequently Asked Question (FAQ) section, an operation section, an installation section and a maintenance section.

[0053] In an embodiment of the present invention, if the query is associated with a TS and a FAQ section, 20 then the query may be provided to a problem type classifier 306 to identify the problem associated with the query. For instance, if the user query is "I am hearing a loud sound" then the problem type classifier may identify the problem as "noise". In another 25 embodiment of the present invention, if the query is associated with the operation section, then the query may be provided to a sub-section classifier 308 to identify the subjection associated with the query. For instance, if the user query is "Tell precautions for 30 IcePlus" then the sub-section classifier 308 may

identify the subsection as "Ice Plus Feature". In yet another embodiment of the present invention, if the query is associated with the operation, installation and maintenance section, then the query may be provided to
5 an ensemble 310 to convert the query into the machine understandable language using sentence Bidirectional Encoder Representations from Transformers (BERT) with cosine similarity 312. The BERT may extract the embeddings of the query and a cosine similarity metric
10 may be utilized to extract similar keys that map to manual content representing actual answer for the query.

[0054] Further, a list of canonical queries associated with keys, embedding for TS, specification, FAQ, operation and installation, such as "Why am I
15 getting unusual noise?" may be stored as files, as shown by 314. Further, the outputs of the problem type classifier 306, sub-section classifier 308 and list of canonical queries may be provided to one or more text similarity mappers 316. The text similarity mapper 316
20 may be configured to map similar text from the list of sub-title keys, a list of subsection keys and a list of subtitle keys. Then, the various keys may be provided as multiple choices to the user, as shown by 318. Next, the key associated with the accepted answer by the user may
25 be provided to a retrieval engine and a graph database interface, as shown by 320 to update the database 118. The database 118 may be configured to update the schema and data model, as shown by 322 and all sections and sub-section as entities and relations, as shown by 324.
30 Additionally, the accepted answer may also be provided to a response generator 326 to generate a response by

employing a template associated with a Natural Language Generator (NLG).

5 **[0055]** In an embodiment of the present invention, the data analytics engine 120 may include an issue classifier 122, a feature classifier 124, an issue registry 126, a statistical analysis module 128 and an issue frequency counter 130.

10 **[0056]** Figure 4 illustrates an architecture diagram of the issue classifier 122 in accordance with an embodiment of the present invention. Figure 4(b) illustrates an architecture diagram of the feature classifier 124 in accordance with an embodiment of the present invention. For the sake of brevity, Figures 4(a) and 4(b) have been explained together.

15 **[0057]** In an embodiment of the present invention, the issue classifier 122 may include a topic classifier 402 and a type classifier 404, as shown in Figure 4(a). The topic classifier 402 may be configured to identify a topic associated with the query, such as specification, troubleshooting and operation. In an embodiment of the present invention, if the associated topic is a specification, then the product specification may be returned, as shown by 406. In another embodiment of the present invention, if the associated topic is troubleshooting and operation, then the query may be provided to the type classifier to classify the type of query. The type of query may without any limitation include, before use, control panel, Sabbath mode, error message, noise, cooling problem, ice problem, Wi-Fi

problem and general problem. Further, the issue classifier 122 may be configured to classify issue associated with the one or more queries based on the inputs from the topic classifier 402, the type classifier 5 404 or a combination thereof.

[0058] In an embodiment of the present invention, the feature classifier 124 may be configured to classify one or more specific issues associated with the one or more queries, as shown in Figure 4(b). The one or more 10 specific issues may correspond to features, such as ice plus and Sabbath mode. Further, the feature classifier 124 may utilize an information extraction technique known in the art to classify and extract specific feature information and issue information. In an exemplary 15 embodiment of the present invention, the query may be "what is ice plus function?" and the feature classifier 124 may extract "ice plus", as shown by 408. In another exemplary embodiment of the present invention, the query may be "tell me about sabbath mode" and the feature 20 classifier 124 may extract "sabbath mode", as shown by 410. Further, the issues registry 126 may be configured to store the one or more classified issues and specific issues.

[0059] Figure 5 illustrates a block diagram of the 25 statistical analysis module 128 in accordance with an embodiment of the present invention. In an embodiment of the present invention, the statistical analysis module 128 may be configured to identify the patterns of the one or more classified issues and specific issues. In 30 order to identify the patterns of the one or more

classified issues and specific issues , the statistical analysis module 128 may be configured to receive the user query 502. Then, the statistical analysis module 128 may provide the user query 502 to the statistical model 504 to identify the patterns of the one or more classified issues and specific issues . The statistical model 504 may utilize an information extraction technique known in the art to extract features and maintain a frequency of the feature. In an embodiment of 5 the present invention, the patterns may be represented by a bar graph indicating features on an x-axis and frequency on the y-axis, as shown by 506. In an embodiment of the present invention, the statistical analysis module 128 may be configured to employ one or 10 more Machine Learning (ML) models to identify the patterns of the one or more classified issues and specific issues.

[0060] In an embodiment of the present invention, an issue frequency counter 130 may be configured to extract 20 and store the frequency of the one or more classified issues and specific issues.

[0061] In an embodiment of the present invention, the automated system 100 may include a report production system 132. The report production system 132 may be 25 configured to generate a smart services based product feedback report based on the classified and categorized one or more queries.

[0062] Figure 6 illustrates an operation of the automated system to manage product feedbacks in accordance with an embodiment of the present invention.

[0063] In operation, the one or more input modules 102 may receive a user query, as shown by 602. The user query may be in the form of a speech, a text, an image or a combination thereof. Next, the user query may be categorized into various modes, as shown in 604. Further, the speech input may be converted into a text via a speech-to-text converter, as shown by 606. Next, the triple extraction module 110 may obtain a triple from text input and image input, as shown by 608. Next, the graph summarization module 112 may identify the relevance of the triple, as shown by 610. Next, the intelligent query formation module 114 may form a query, as shown by 612.

[0064] Next, the query answering module 116 may extract an answer to the user query from the database 118, as shown by 614. Further, the query answering module 116 may also be configured to receive user feedback based on the extracted answer to the query. Then, the query may be provided to a data analytics engine 120, as shown by 616. Next, the data analytics engine 120 may be configured to check if the frequency count of the query is more than a pre-defined threshold value, as shown by 618. Further, the data analytics engine 120 may check if there is an issue, as shown by 620. In an embodiment of the present invention, if the frequency count of the query is more than a pre-defined value then the issue 30 may be provided to the report production system 132, as

shown by 622. In another embodiment of the present invention, if the frequency count of the query is less than the pre-defined value then the issue may be provided to the production system as a popular feature among the 5 users, as shown by 624.

[0065] Figure 7 illustrates an implementation of the automated system to manage product feedbacks in accordance with an exemplary embodiment of the present invention. In operation, a user 702 may ask a question 10 through a chatbot application in the form of a combination of a text input 704, a speech input 706 and an image input 708. The speech input may be converted into text via a speech-to-text converter. In an embodiment of the present invention, the image input 708 15 may be provided to the image processing module 202 to extract relevant text from each zone in the image, such as temp zone, spin zone and mode zone. Further, the text input may be provided to a text processing module 204. Next, the triple builder 206 may be configured to build 20 a triple using the text input, the image input or a combination thereof, such as (topic, has_specific_type, IE error), (topic, state_mode, Mix), (topic, state_Temp, 40 deg) and (topic, has_spin, 1000). Next, the intelligent query formation module 114 may form a query 25 based on the extracted triple, such as "How to fix IE Error with mode as Mix, at temp 40 degree, Spin 1000?".

[0066] Next, the query answering module 116 may be configured to provide the answer 710 to the user query from the database 118. Further, the query answering 30 module 116 may also be configured to receive user

feedback 712 based on the extracted answer to the query. Further, the query may be provided as a system feedback 714 to the data analytics engine 120. The data analytics engine 120 may be configured to employ an ML model to 5 analyze, categorize and keep track of the count of all issues, as shown by 716. Further, the data analytics engine 120 may be configured to store the issue, as shown by 718. In an embodiment of the present invention, the data analytics engine 120 may also categorize the issue 10 based on frequency as low, medium, high and very high. Further, a feature will be tagged as "NA" and an issue will be tagged as "IE". For instance, the issue may be stored as Issue type: IE, Mode: Mix, Feature: N/A, Frequency: Very High. Next, the stored issue may be 15 provided to a report production system 132 to generate a report for the production team to provide a permanent fix of the issue in the next release, as shown by 720. In an embodiment of the present invention, the production team may fix issues associated with hardware, software 20 or combination thereof based on the severity and frequency of an issue in the report.

[0067] Figure 8 illustrates an implementation of the automated system to manage product feedbacks in accordance with another exemplary embodiment of the 25 present invention. In operation, a user 802 may provide a feedback in the form of a combination of a text input 804 and a speech input 806. The speech input may be converted into text via a speech-to-text converter. Next, the triple builder 206 may be configured to build 30 a triple using the text input such as (topic, has_specific_type, Ice plus function) and (topic,

has_query_objective, usage). Next, the intelligent query formation module 114 may form a query based on the extracted triple, such as "How to use Ice Plus Function?". It may be noted that the final query may be
5 the same as the original question by the user.

[0068] Next, the query answering module 116 may be configured to provide the answer 808 to the user query from the database 118. Further, the query answering module 116 may also be configured to receive user
10 feedback 810 based on the extracted answer to the query. Further, the query may be provided as a system feedback 812 to the data analytics engine 120. The data analytics engine 120 may be configured to employ an ML model to analyze, categorize and keep track of the count of all
15 issues, as shown by 814. Further, the data analytics engine 120 may be configured to store the issue, as shown by 816. The issue may be stored as Issue type: N/A, Mode: N/A, Feature: Ice Plus, Frequency: High. Next, the stored issue may be provided to a report production system 132
20 to inform the production system that Ice Plus Function is a popular feature among the users, as shown by 818. In an embodiment of the present invention, the production team may decide if a feature is an important feature based on the frequency of the feature and may include
25 such feature in similar products in the future.

[0069] Thus, the present invention provides an automated system 100 to manage product feedback. The automated system 100 supports multimodal inputs by the user including text, speech and image. Further, the
30 intelligent query formation module 114 takes multimodal

inputs to form a text query with complete information from the multimodal inputs to understand the user query efficiently. Further, query answering module 116 automatically analyzes the user issues and provides a 5 solution to the user issues. Furthermore, the data analytics engine 120 stores and informs the production team regarding the frequent issues and popular features for improvement in the future batches of products.

[0070] Figure 9 is a flowchart illustrating an 10 automated method to manage product feedbacks in accordance with an embodiment of the present invention

[0071] At step 902, one or more inputs may be received in one or more modes from the user, the one or more inputs are associated with user questions and feedbacks 15 related to a product.

[0072] Next, at step 904, a query may be formed based on the one or more modes of inputs by employing one or more Machine Learning (ML) models. Next, at step 906, a relevant answer to the smart query may be extracted from 20 a database.

[0073] Thereafter, at step 908, the one or more smart queries may be classified and categorized to provide one or more smart services based on product feedback.

[0074] In an embodiment of the present invention, the 25 one or modes of inputs may include at least one of: text, speech and image associated with the product. Further, the automated method may include converting the speech input into text via a speech-to-text converter.

[0075] In an embodiment of the present invention, the automated method may include extracting a data entity from the one or more inputs, identifying the relevance of the data entity by employing one or more Machine Learning (ML) models and forming a smart query based on the extracted data entities from the one or more inputs. Further, forming the query is performed by a Natural Language Generation (NLG) model. Further, the data entity corresponds to at least one of: a subject, a predicate and an object of a triple.

[0076] In an embodiment of the present invention, the automated method may include extracting a relevant zone from the image input associated with the product, extracting a text from the extracted relevant zone and extracting a value from the extracted relevant zone to extract the data entity from the image input.

[0077] In an embodiment of the present invention, the automated method may include identifying a named entity from the text input, extracting the relation of the identified named entity and identifying a type of question to extract the triple from the text input. Further, the automated method includes building a triple based at least on one of: the image inputs and the text inputs.

[0078] In an embodiment of the present invention, the automated method may include classifying issues associated with the one or more smart queries based at least on one of: a topic classifier and a type classifier. Next, classifying one or more specific

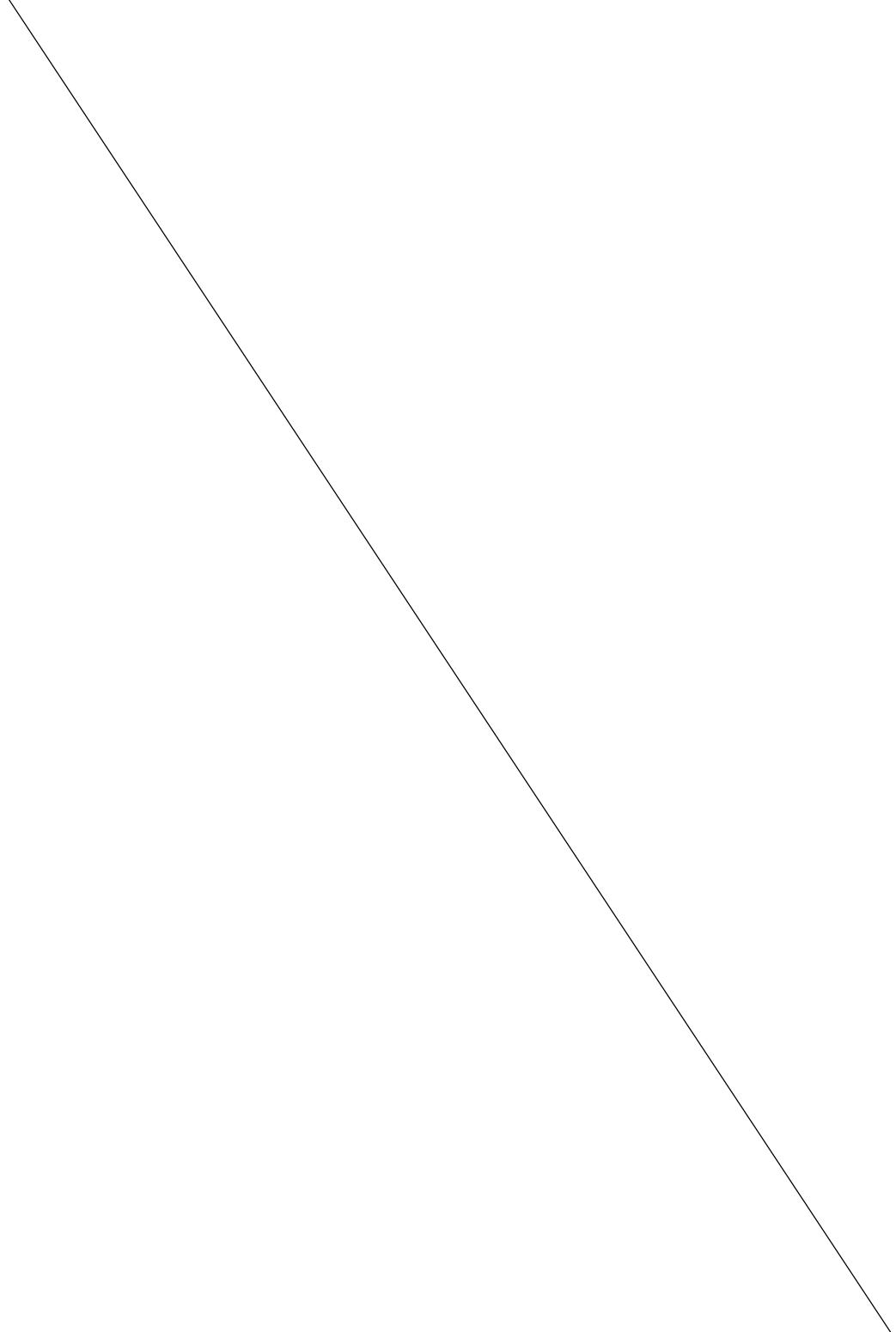
issues associated with the one or more smart queries, Next, storing the one or more issues and specific issues and identifying the patterns of the one or more issues and the specific issues by employing one or more Machine Learning (ML) models. Thereafter, the automated method may include extracting and storing the frequency of the one or more issues and specific issues.

[0079] In an embodiment of the present invention, the automated method may include generating a smart services based product feedback report based at least on the classified and categorized one or more queries. Further, the database may include a knowledge graph of a manual associated with one or more products.

[0080] Thus, the present invention provides an automated method to manage product feedback. The automated method supports multimodal inputs by the user including text, speech and image. Further, the automated method takes multimodal inputs to form a text query with complete information from the multimodal inputs to understand the user query efficiently. Further, the automated method automatically analyzes the user issues and provides a solution to the user issues. Furthermore, the automated method stores and informs the production team regarding the frequent issues and popular features for improvement in the future batches of products.

[0081] While the exemplary embodiments of the present invention are described and illustrated herein, it will be appreciated that they are merely illustrative. It will be understood by those skilled in the art that

various modifications in form and detail may be made therein without departing from or offending the scope of the invention as defined by the appended claims.



We claim:

1. An automated system (100) to manage product feedback, the automated system (100) comprising:

one or more input modules (102) to receive one
5 or more inputs via one or more modes from the user,
the one or more inputs are associated with user
questions and feedbacks related to a product;

10 a canonical query formation engine (104),
communicatively coupled to a microprocessor, to form
a smart query based on the one or more modes of
inputs by employing one or more Machine Learning
(ML) models;

15 a query processing and analysis engine (106),
communicatively coupled to the microprocessor,
having:

a query answering module (116) to extract a
relevant answer to the smart query from a
database (118); and

20 a data analytics engine (120) to classify
and categorize the one or more smart queries to
provide one or more smart services based on
product feedback.

25 2. The automated system (100) as claimed in claim 1,
wherein the one or modes of inputs include at least
one of: text, speech and image associated with the
product.

3. The automated system (100) as claimed in claim 2, further comprises a conversion module (108) having at least a speech-to-text converter to convert the speech input into text.
- 5 4. The automated system (100) as claimed in claim 1, wherein the canonical query formation engine (104) further comprises:
 - a triple extraction module (110) to extract a data entity from the one or more inputs;
 - 10 a graph summarization module (112) to employ one or more ML models to identify the relevance of the data entity; and
 - 15 an intelligent query formation module (114) to form a smart query based on the extracted data entity from the one or more inputs by employing a Natural Language Generation (NLG).
5. The automated system (100) as claimed in claim 4, wherein the data entity corresponds to at least one of: a subject, a predicate and an object of a data entity.
- 20 6. The automated system (100) as claimed in claim 1, wherein the triple extraction module (110) further includes an image processing module (202) having:
 - 25 an image segmentation module (208) to extract a relevant zone from the image input associated with the product;

an optical character recognition (210) to extract a text from the extracted relevant zone; and

a zone label value extractor (212) to extract a value from the extracted relevant zone.

5 7. The automated system (100) as claimed in claim 1, wherein the triple extraction module (110) further includes a text processing module (204) having:

a named entity recognition module (214) to identify a named entity from the text input;

10 a relation extraction module (216) to extract the relation of the identified named entity; and

a question type classifier (222) to identify a type of question.

8. The automated system (100) as claimed in one of
15 claims 6 and 7, wherein the triple extraction module (110) further includes a triple builder (206) to build a triple based at least on the inputs from one of: the image processing module (202) and the text processing module (204).

20 9. The automated system (100) as claimed in claim 1, wherein the data analytics engine (120) further includes:

25 an issue classifier (122) to classify issues associated with the one or more smart queries based at least on one of: a topic classifier (502) and a type classifier (504);

a feature classifier (124) to classify one or more specific issues associated with the one or more smart queries;

5 an issue registry (126) to store the one or more issues and specific issues;

a statistical analysis module (128) configured to employ one or more Machine Learning (ML) models to identify the patterns of the one or more issues and the specific issues; and

10 an issue frequency counter (130) to extract and store the frequency of the one or more issues and the specific issues.

15 10. The automated system (100) as claimed in claim 1, further comprises a report production module (132) configured to generate a smart services based product feedback report based at least on the classified and categorized one or more queries.

20 11. The automated system (100) as claimed in claim 1, wherein the database (118) includes a knowledge graph of a manual associated with one or more products.

12. An automated method to manage product feedbacks, the automated method comprising:

25 receiving one or more inputs via one or more modes from the user, the one or more inputs are

associated with user questions and feedbacks related to a product;

5 forming a smart query based on the one or more modes of inputs by employing one or more Machine Learning (ML) models;

extracting a relevant answer to the smart query from a database; and

10 classifying and categorizing the one or more smart queries to provide one or more smart services based product feedbacks.

13. The automated method as claimed in claim 12, wherein the one or modes of inputs include at least one of: text, speech and image associated with the product.

14. The automated method as claimed in claim 12, further 15 comprises converting the speech input into text via a speech-to-text converter.

15. The automated method as claimed in claim 12, further comprises:

20 extracting a data entity from the one or more inputs;

identifying the relevance of the data entity by employing one or more ML models; and

25 forming a smart query based on the extracted data entity from the one or more inputs by employing a Natural Language Generation (NLG) model.

16. The automated method as claimed in claim 15, wherein
the data entity corresponds to at least one of: a
subject, a predicate and an object of a triple.
17. The automated method as claimed in claim 12, further
5 comprises:
 - extracting a relevant zone from the image input
associated with the product;
 - extracting a text from the extracted relevant
zone; and
- 10 extracting a value from the extracted relevant
zone to extract the data entity from the image input.
18. The automated method as claimed in claim 12, further
comprises:
 - identifying a named entity from the text input;
 - 15 extracting the relation of the identified named
entity; and
 - identifying a type of question to extract the
data entity from the text input.
19. The automated method as claimed in one of claims 17
20 and 18, further comprises building a triple based at
least on one of: the image inputs and the text
inputs.
20. The automated method as claimed in claim 12, further
comprises:

classifying issue associated with the one or more smart queries based at least on one of: a topic classifier and a type classifier;

5 classifying one or more specific issues associated with the one or more smart queries;

 storing the one or more issues and specific issues;

10 identifying the patterns of the one or more issues and the specific issues by employing one or more Machine Learning (ML) models; and

 extracting and storing the frequency of the one or more issues and specific issues.

21. The automated method as claimed in claim 12, further comprises:

15 generating a smart services based product feedback report based at least on the classified and categorized one or more queries.

22. The automated method as claimed in claim 12, wherein the database includes a knowledge graph of a manual 20 associated with one or more products.

Dated this 23rd day of February 2022

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25

ABSTRACT**AN AUTOMATED SYSTEM AND METHOD TO MANAGE PRODUCT FEEDBACKS**

[0082] An automated method to manage product
 5 feedbacks. The automated method includes receiving one or more inputs via one or more modes from the user, the one or more inputs are associated with user questions and feedbacks related to a product. Further, the automated method includes forming a smart query based on
 10 the one or more modes of inputs by employing one or more Machine Learning (ML) models. The automated method also includes extracting a relevant answer to the smart query from a database. Thereafter, the automated method includes classifying and categorizing the one or more smart queries to provide one or more smart services based
 15 product feedbacks.

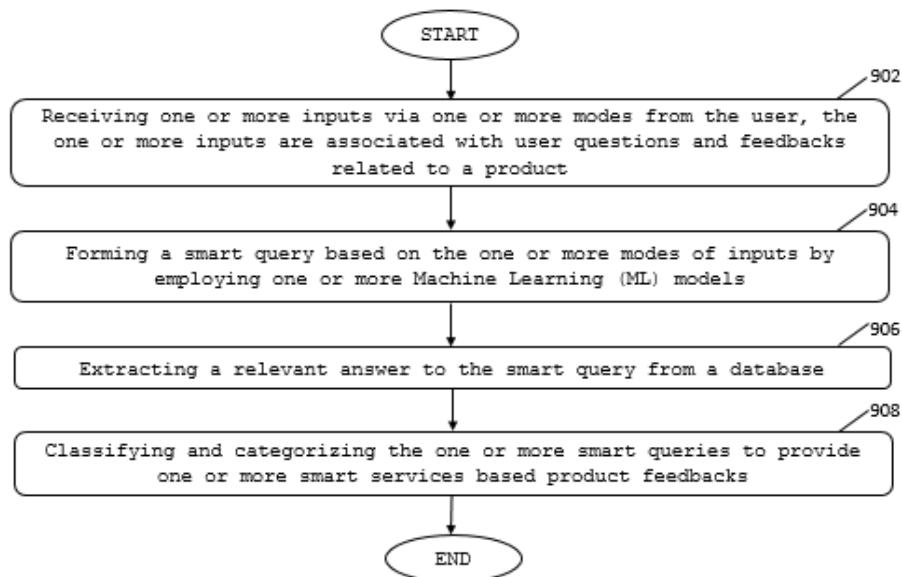


Figure 9

NAME OF APPLICANT:
LG ELECTRONICS INC.

TOTAL SHEETS: 13
SHEET NO.: 01

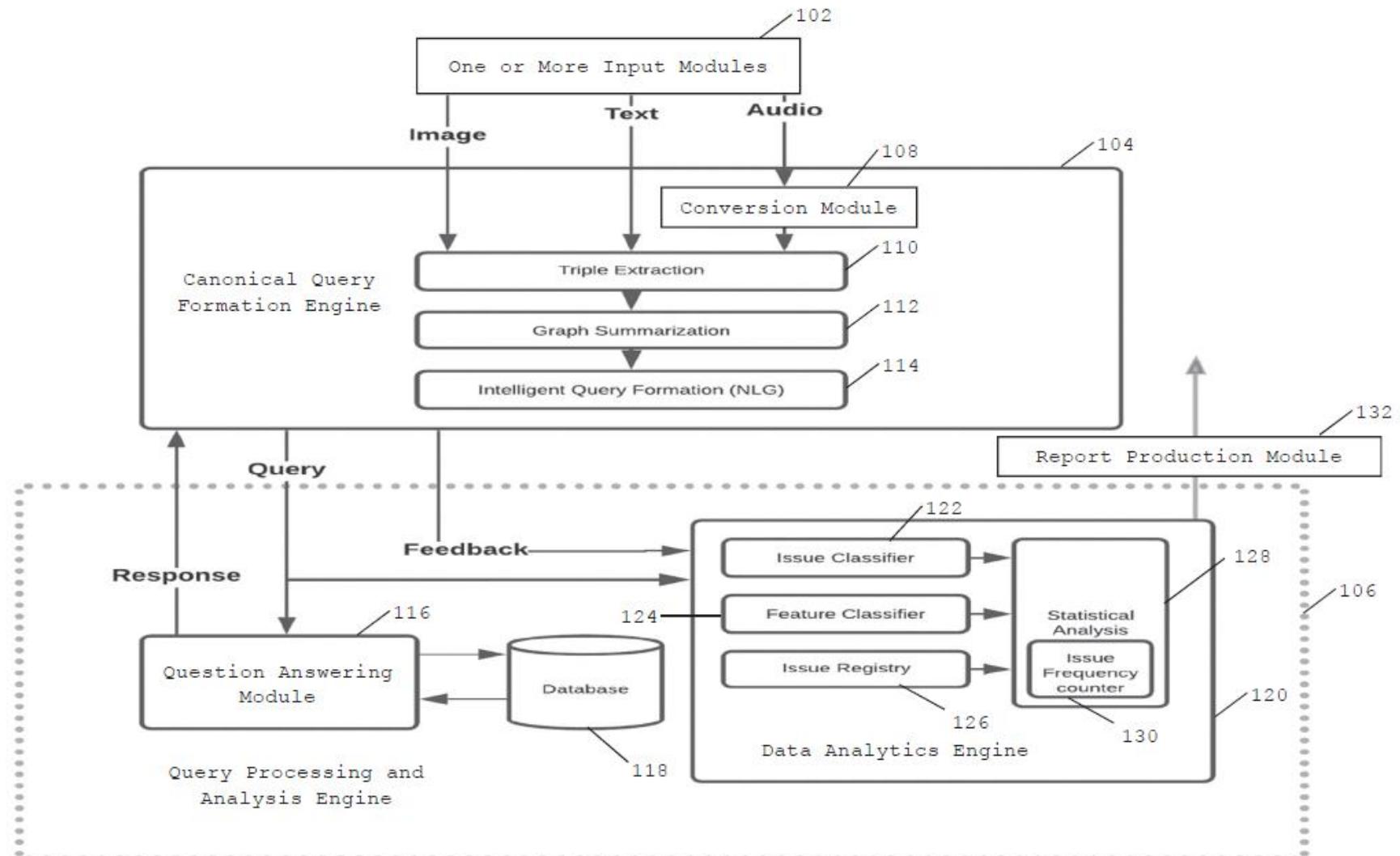


Figure 1

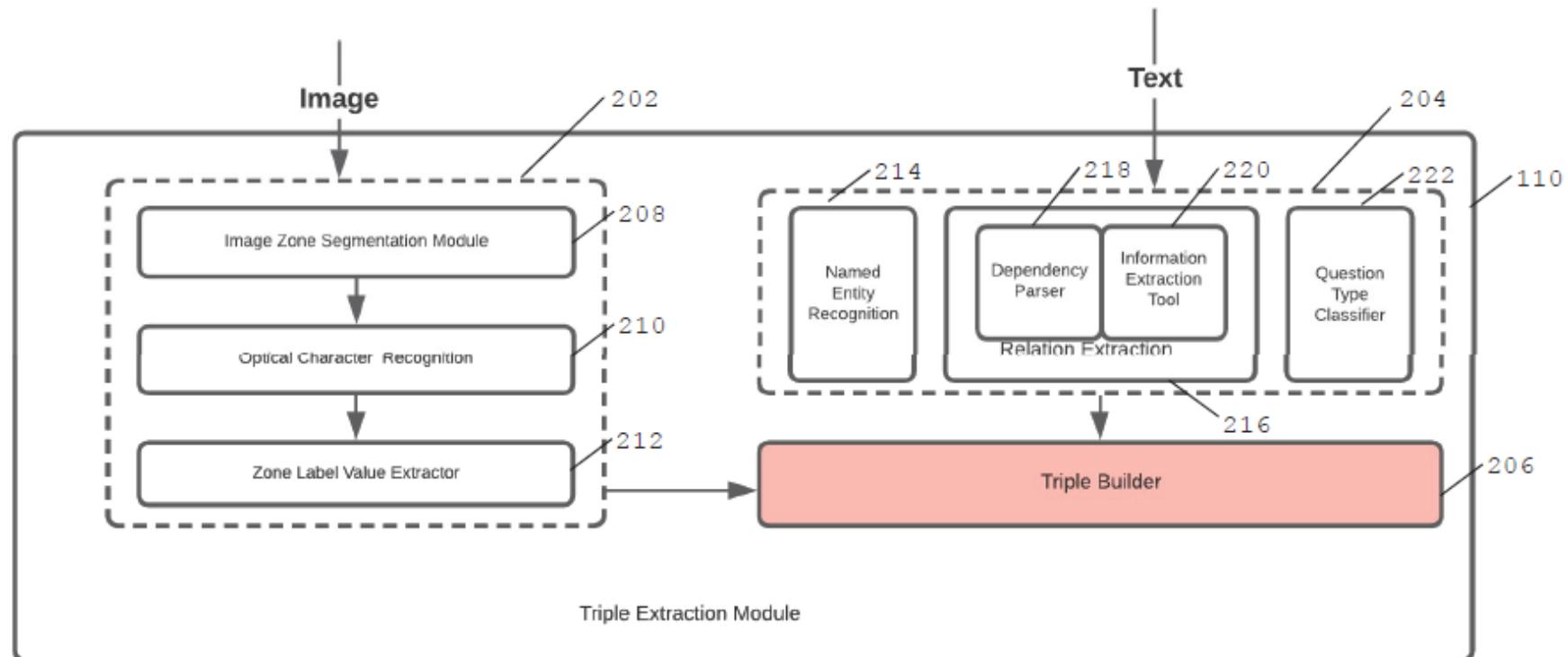


Figure 2 (a)

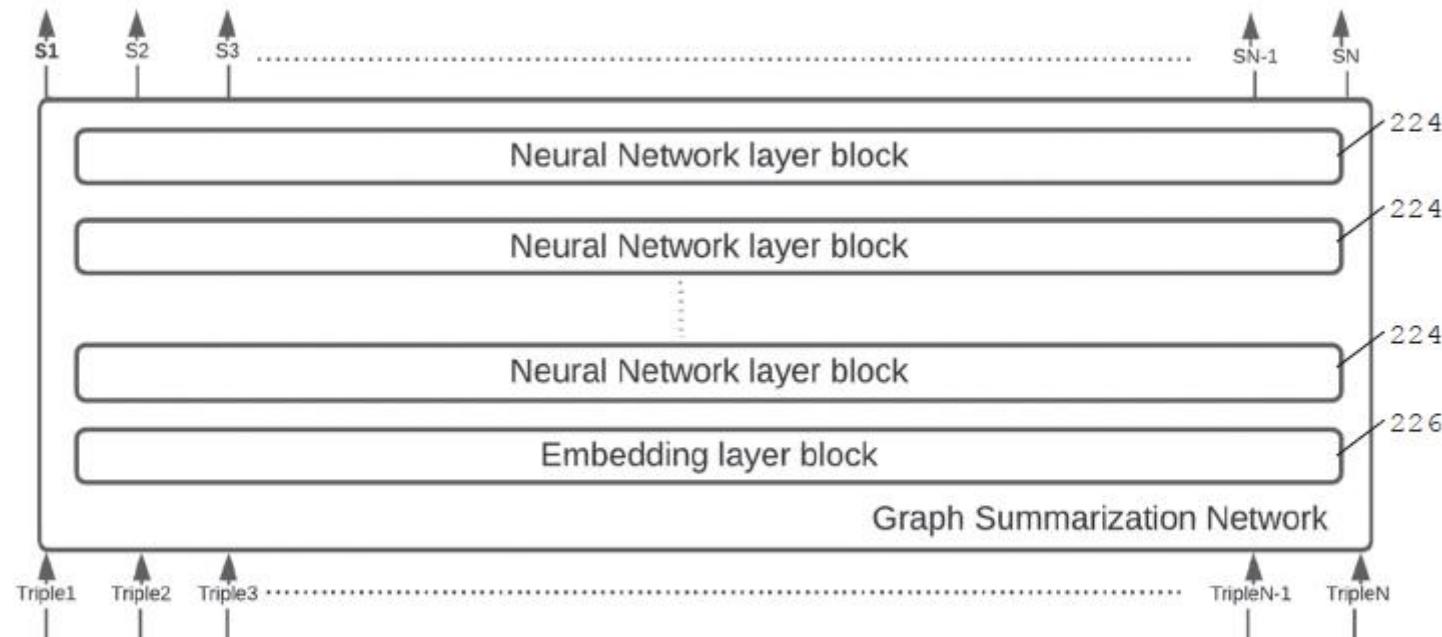


Figure 2 (b)

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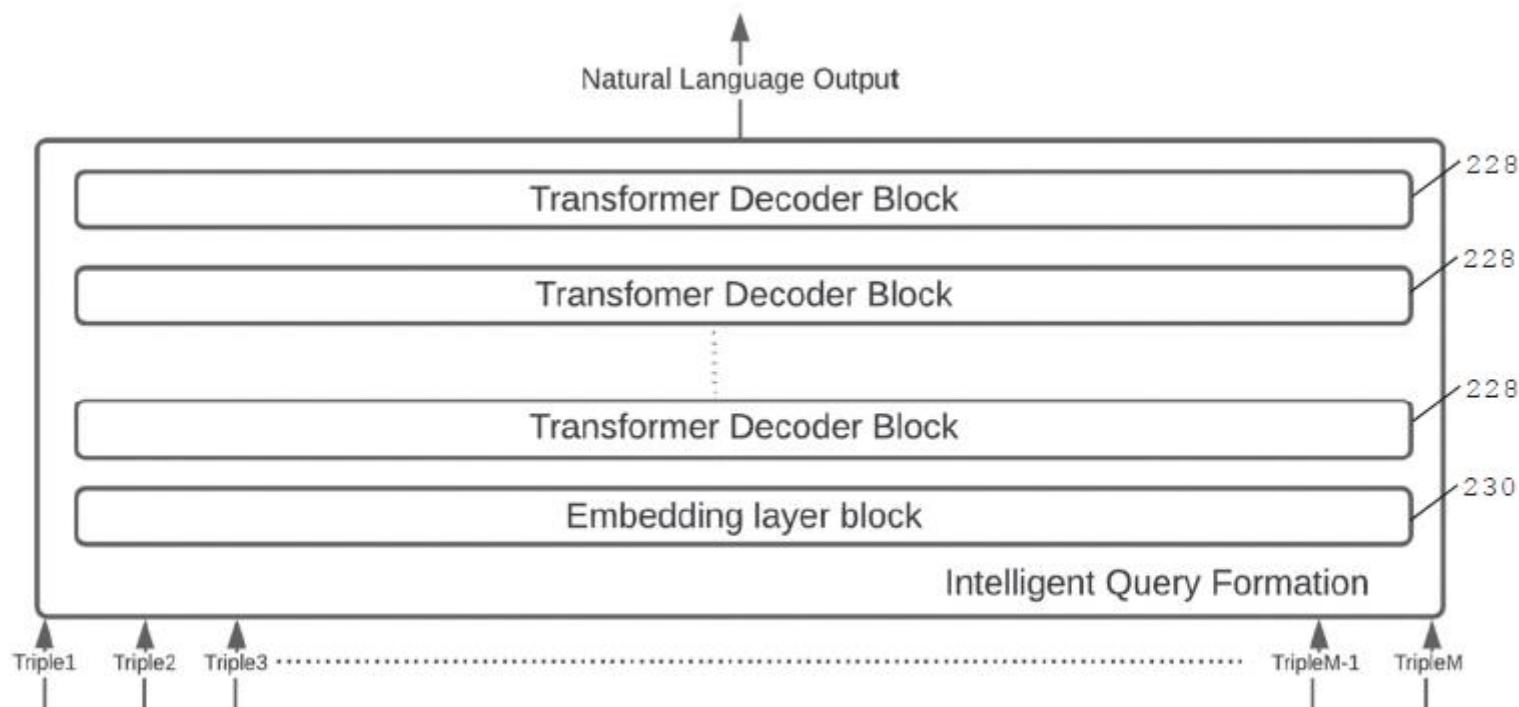


Figure 2 (c)

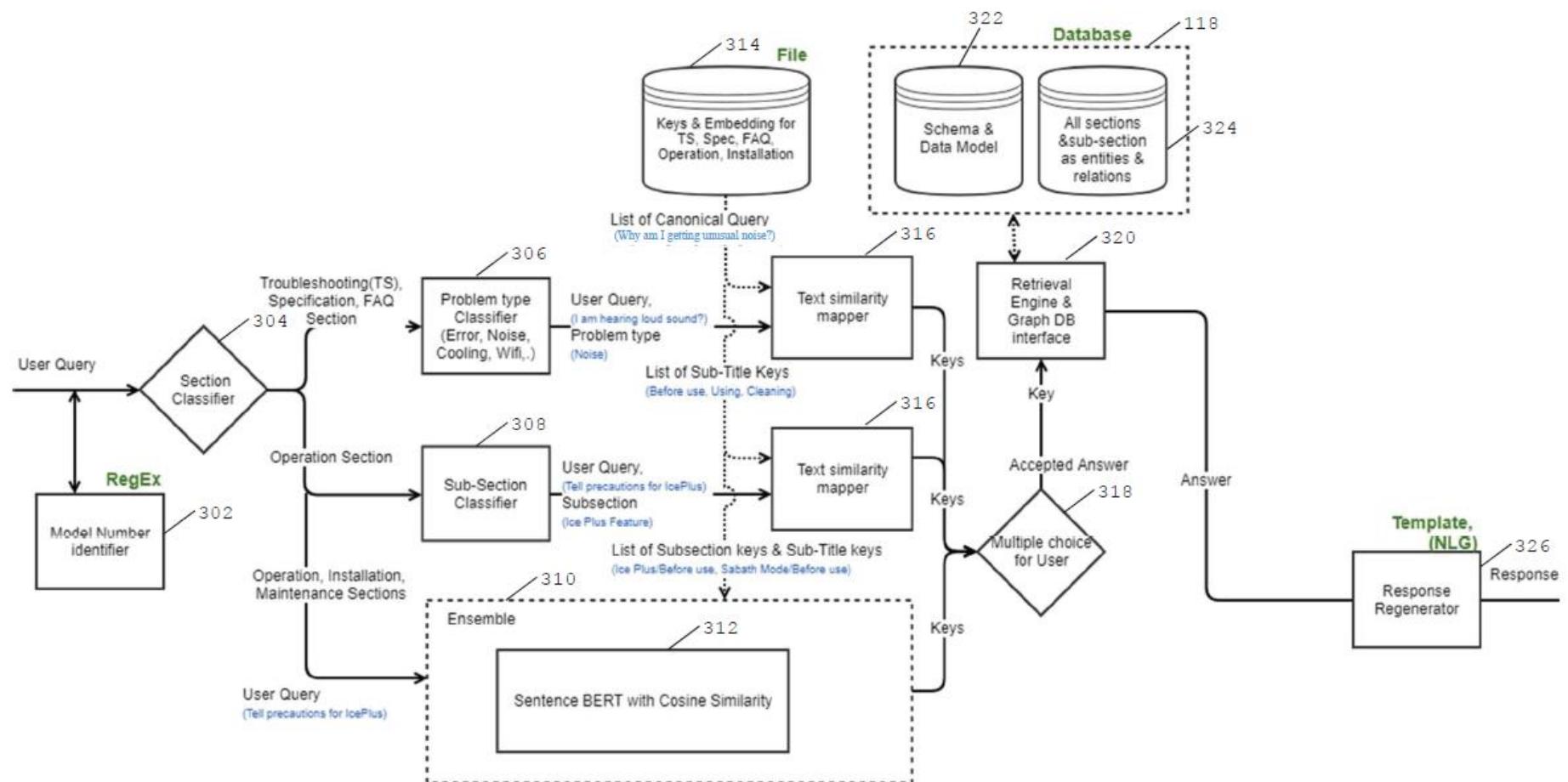


Figure 3 (a)

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NAME OF APPLICANT:
LG ELECTRONICS INC.

TOTAL SHEETS: 13
SHEET NO.: 06

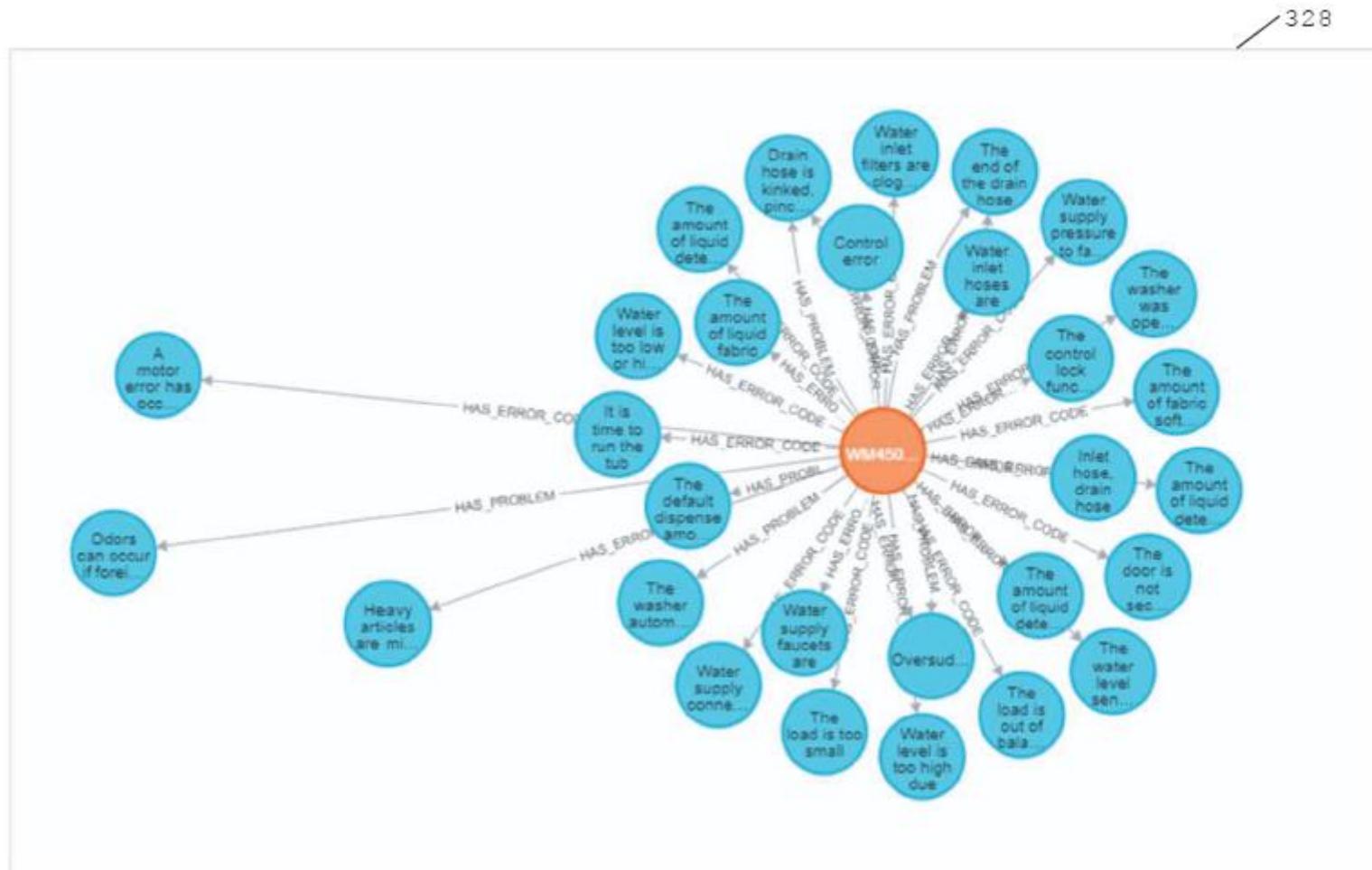


Figure 3 (b)

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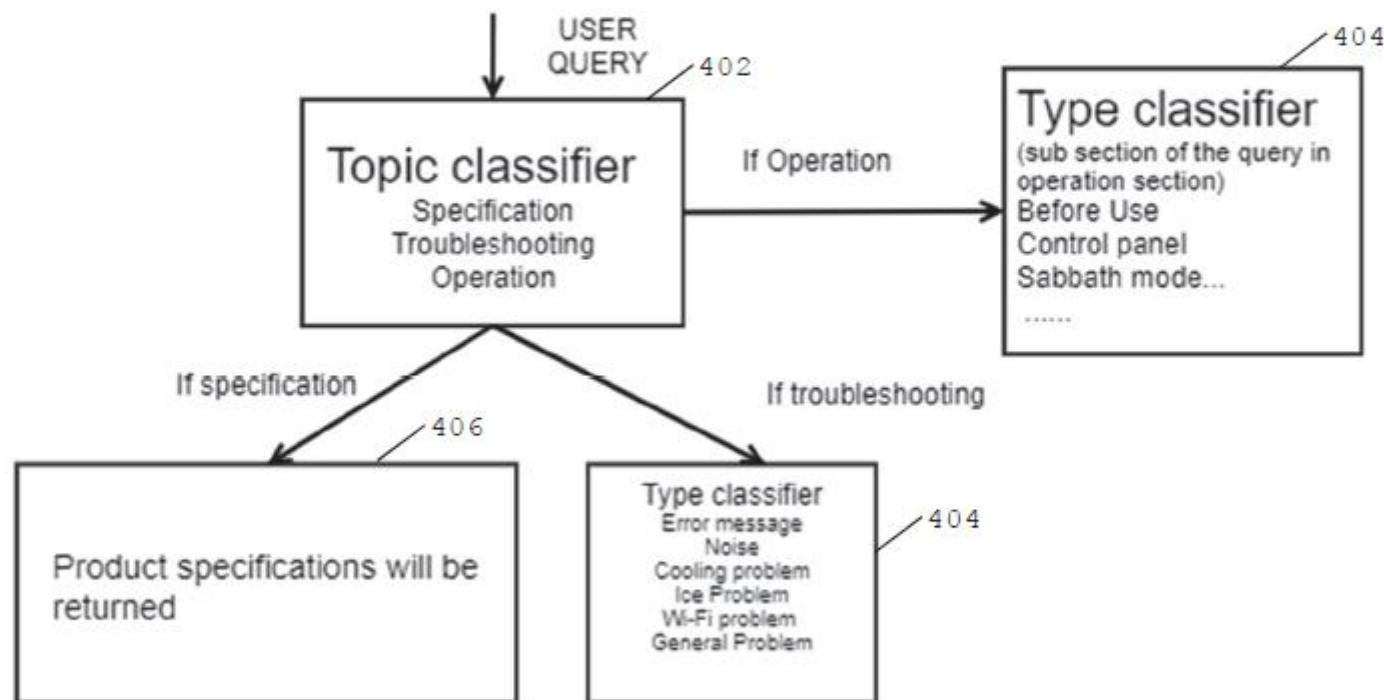


Figure 4 (a)

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NAME OF APPLICANT:
LG ELECTRONICS INC.

TOTAL SHEETS: 13
SHEET NO.: 08

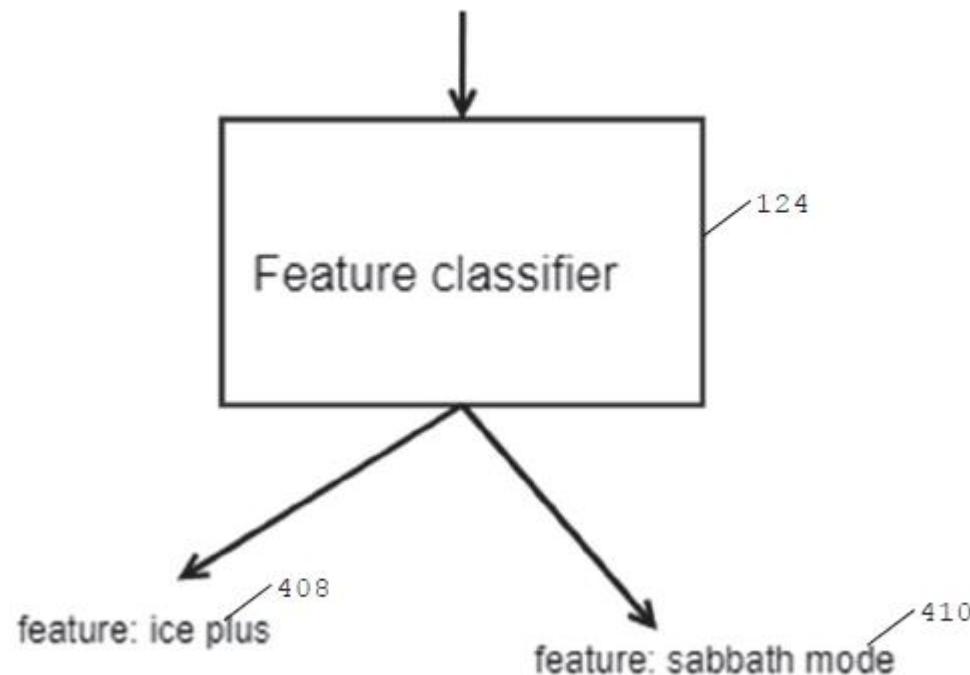


Figure 4 (b)

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NAME OF APPLICANT:
LG ELECTRONICS INC.

TOTAL SHEETS: 13
SHEET NO.: 09

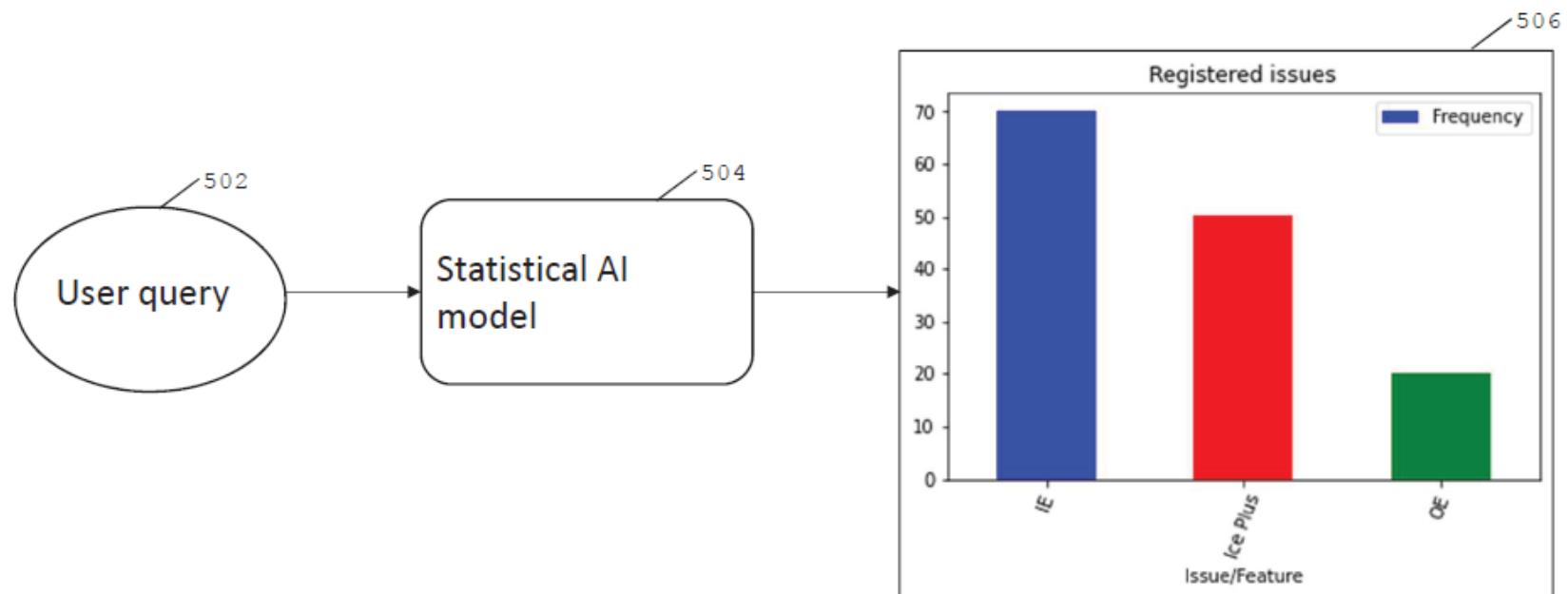


Figure 5

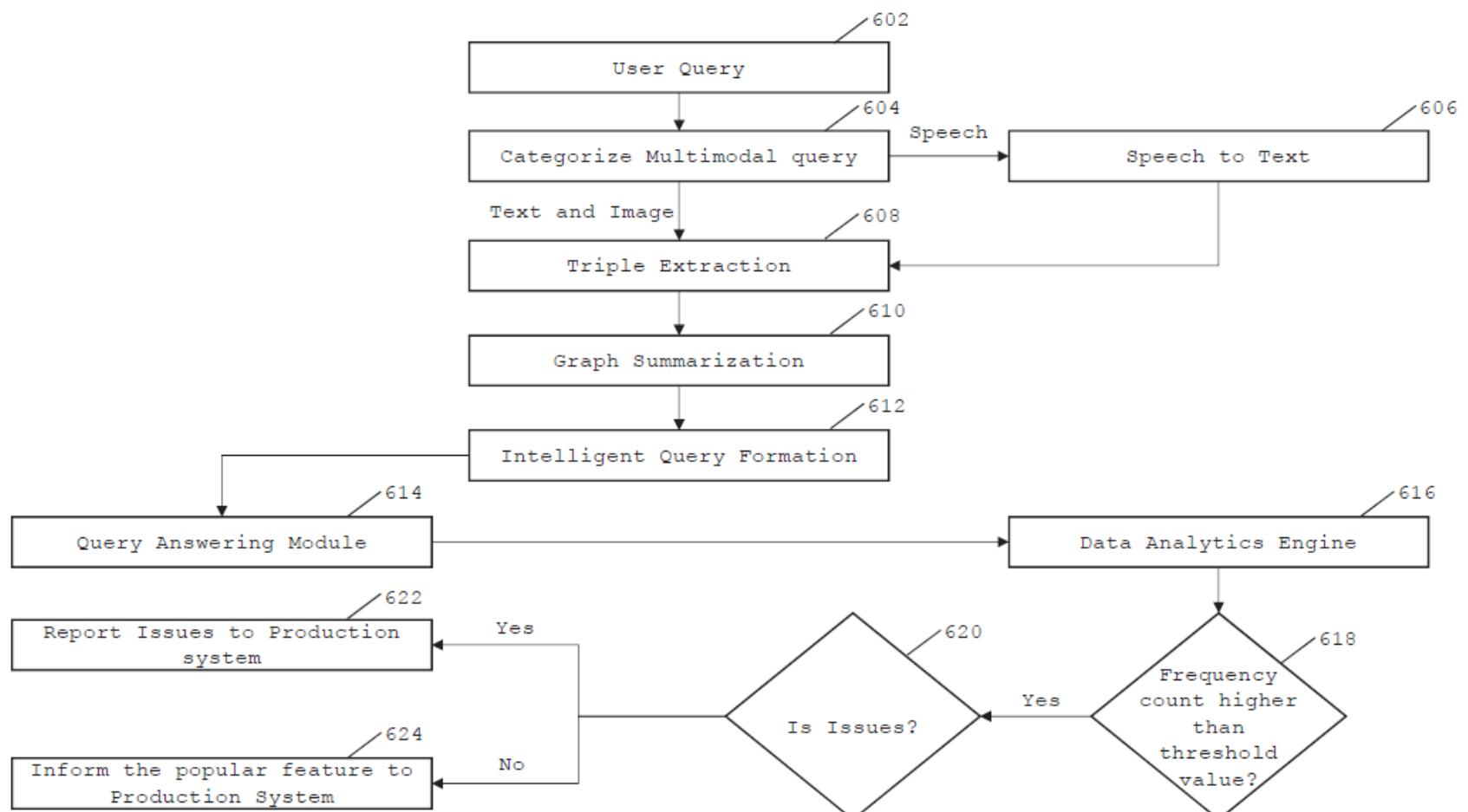


Figure 6

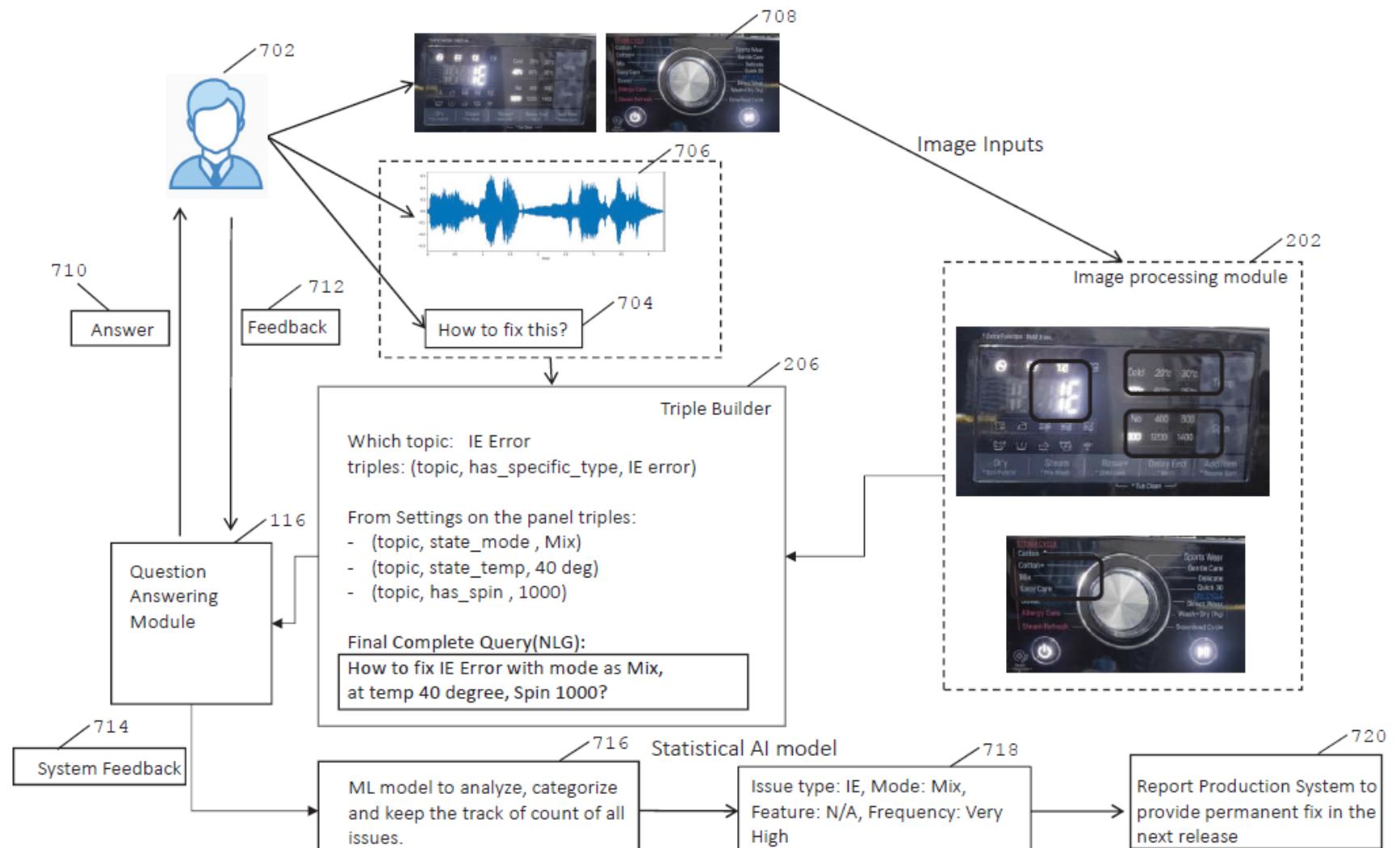


Figure 7

(RAHUL ADEY)

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NAME OF APPLICANT:
LG ELECTRONICS INC.

TOTAL SHEETS: 13
SHEET NO.: 12

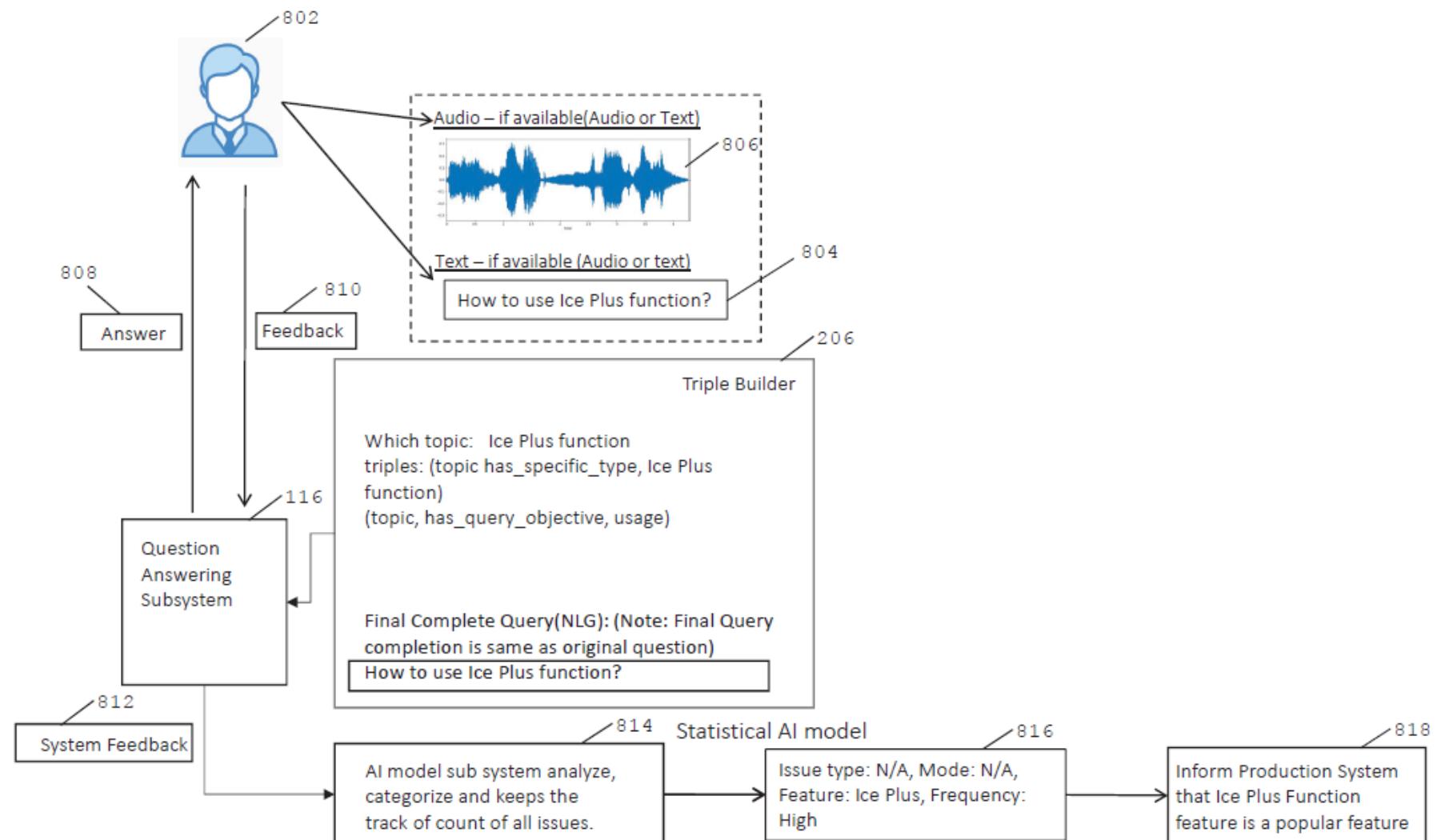


Figure 8

NAME OF APPLICANT:
LG ELECTRONICS INC.

TOTAL SHEETS: 13
SHEET NO.: 13

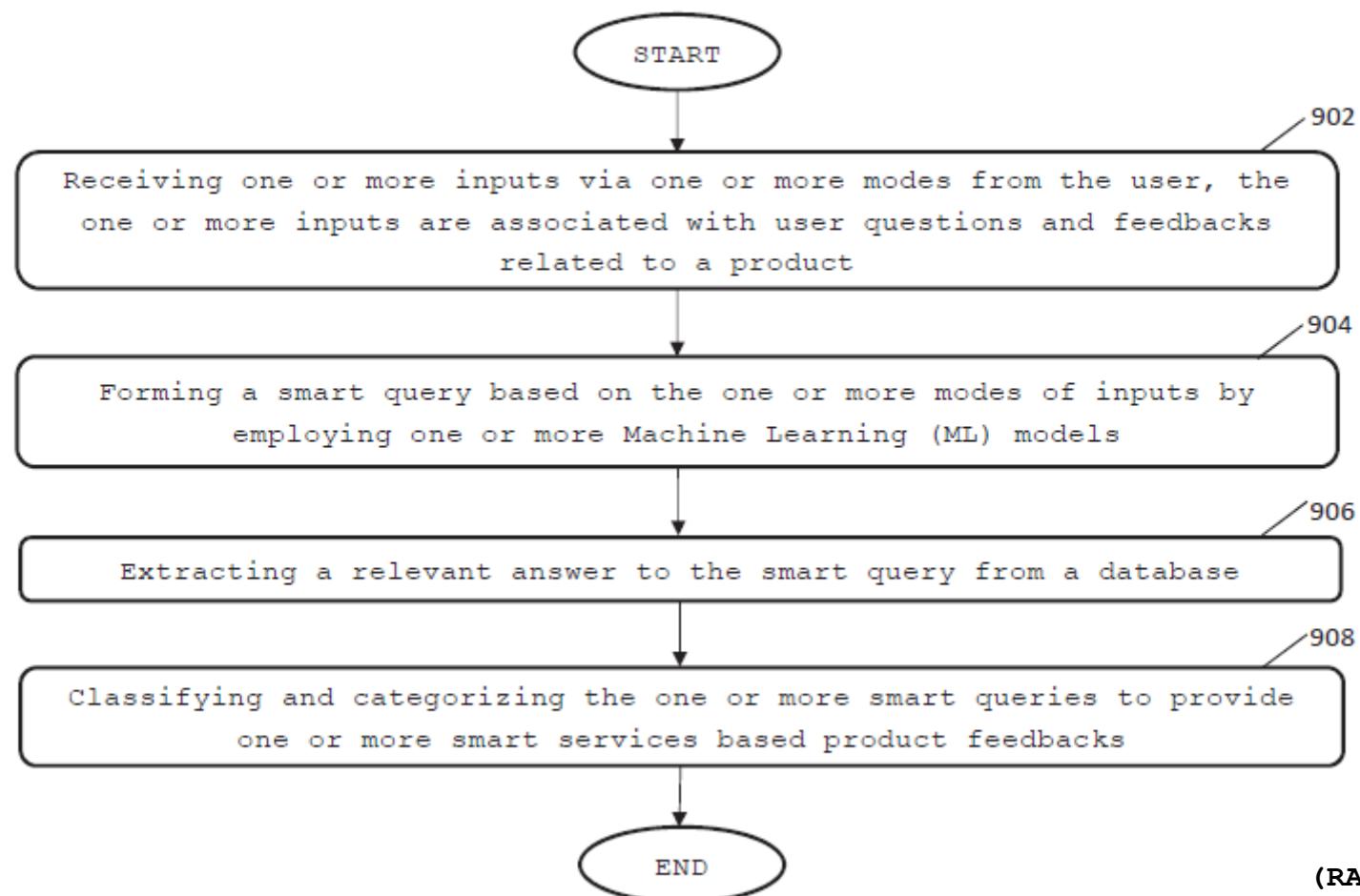


Figure 9

(RAHUL ADEY)

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