(12) STANDARD PATENT (11) Application No. AU 2007314123 B2
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Email document parsing method and apparatus

(51) International Patent Classification(s)
G06F 17/30 (2006.01)

(21) Application No: **2007314123** (22) Date of Filing: **2007.04.05**

(87) WIPO No: **WO08/052239**

(30) Priority Data

(31) Number	(32) Date	(33) Country
2006906095	**2006.11.03**	**AU**
2006906623	**2006.11.28**	**AU**

(43) Publication Date: **2008.05.08**
(44) Accepted Journal Date: **2009.09.03**

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(56) Related Art
WO 2006/083820
WO 2001/025966
US 2004/0024825

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 May 2008 (08.05.2008)

PCT

(10) International Publication Number
WO 2008/052239 A1

(51) International Patent Classification:
G06F 17/30 (2006.01)

(21) International Application Number:
PCT/AU2007/000440

(22) International Filing Date: 5 April 2007 (05.04.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2006906095 3 November 2006 (03.11.2006) AU
2006906623 28 November 2006 (28.11.2006) AU

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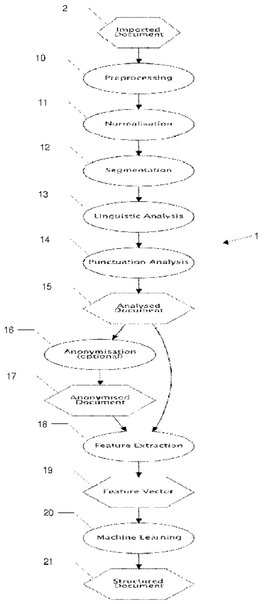
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: EMAIL DOCUMENT PARSING METHOD AND APPARATUS



(57) Abstract: A preferred example of the process flow of the inventive method (1) is depicted in figure (1). The first step (2) of the method (1) is to import an email document (3) to be parsed. In the preprocessing step (10) the email (3) is processed to determine the presence of any header text (5) (excluding any header text that may be within the embedded reply chain) or attachments 4, including attached email documents, if any. Once the header text (5), attachments (4) or other forwarded materials have been identified in the preprocessing step (10), these components of the email (3) are categorized by the computer (51) as non-author composed text. Next the process flow of the parsing computer (51) moves to the step of normalization (11). This entails processing the email document (3) to ascertain whether it is in a preferred format and, if the email document (3) is not in the preferred format, converting at least some of the information within the email document to the preferred format. The parsing computer (51) now progresses through several analysis steps, referred to as the segmentation step (12), the linguistic analysis step (13) and the punctuation analysis step (14). The results of these analysis steps (12) to (14) are recorded in suitable memory or storage means accessible to the CPU of the parsing computer (51). In the segmentation step (12) the text of email (3) is split into paragraphs, and the paragraphs are split into sentences. The linguistic analysis step (13) includes identification of predefined words and phrases of various types. In the punctuation analysis step (14) the parsing computer (51) analyses the text at the character level so as to check for use of sentence punctuation marks and other predefined characters. At the completion of the analysis steps (12) to (14), the process flow proceeds to step (15), in which the analysed email document, including any annotations that have been inserted, is saved into the memory of the computing pparatus, along with any extraneous results of the analysis. Next a number of features are defined at step (18). Typically, a feature is a descriptive statistic calculated from either or both of the raw text and the annotations. At step (19) the features extracted at step (18) are converted into data structures associated with segments of the text. At step (20) the machine learning system receives the data structures and associated lines of text as input and is responsive to that input so as to categorise each line of text as broadly falling into one of two categories: author composed text or non- author composed text.

FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

EMAIL DOCUMENT PARSING METHOD AND APPARATUS

STATEMENT RE U.S. GOVERNMENT RIGHTS

This invention was made with U.S. Government support under Contract No. W91CRB-06-C-0012 awarded by U.S. Army RDECOM ACQ CTR – W91CRB. The U.S. Government has certain rights in this invention.

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for parsing electronic mail (also known as "email") documents. Embodiments of the present invention find application, though not exclusively, in the field of computational text processing, which is also known in some contexts as natural language processing, human language technology or computational linguistics. The outputs of some preferred embodiments of the invention may be used in a wide range of computing tasks such as automatic email categorization techniques, sentiment analysis, author attribution, and the like.

BACKGROUND OF THE INVENTIION

The use of electronic mail, or "email", has become increasingly pervasive throughout the last decade and hence the data contained within email messages may constitute a valuable source of data to some entities, particularly those that either receive or intercept a large volume of email traffic. To assist in extracting and analysing data from emails it is useful in some contexts to focus analysis upon text that has been composed by the author of the email and to disregard other types of text that may be included with typical email documents.

It has been appreciated by the inventors of the present invention that the known prior art attempts to automatically parse text from emails can suffer from a number of disadvantages. In particular, the known prior art identifies only a very limited range of types of non-author composed text and utilises fairly unsophisticated processing techniques. Additionally, the known prior art is typically restricted to analysing emails that are composed in the English language and which are expressed in the ASCII character set. Further, at least some of the prior art was developed at a point in time that was prior to the use of email becoming extremely widespread and such prior art is therefore not well adapted to parse the contemporary genre of email expression.

Any discussion of documents, acts, materials, devices, articles or the like which has been included in this specification is solely for the purpose of providing a context for the present invention. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed in Australia or elsewhere before the priority date of this application.

SUMMARY OF THE INVENTION

It is an object of the present invention to overcome, or substantially ameliorate, one or more of the disadvantages of the prior art, or to provide a useful alternative.

In accordance with a first aspect of the present invention there is provided a computer implemented method of parsing an email document so as to categorize text from the email document as author composed text or non-author composed text, said method including the steps of:

processing the text to determine the presence of signature text and categorizing any such signature text as non-author composed text;

processing the text to determine the presence of automatically appended advertisement text and categorizing any such automatically appended advertisement text as non-author composed text;

processing the text to determine the presence of quotation text and categorizing any such quotation text as non-author composed text;

processing the text to determine the presence of text contained in an embedded reply chain of email messages and categorizing any such text contained in an embedded reply chain of email messages as non-author composed text; and

categorizing at least some of the remaining text as author composed text.

Preferably at least one of the text processing steps includes a linguistic analysis of the words in the text. In one preferred embodiment the linguistic analysis includes identification of predefined words and phrases of any one or more of the following types:

peoples' names, locations, dates, times, organizations, currency, uniform resource locators (URL's), email addresses, addresses, organizational descriptors, phone numbers, typical greetings and/or typical farewells. Such a preferred embodiment typically includes a database of words and phrases of any one or more of the said types. For some applications preferred embodiments of the invention further include the step of anonymising information contained within the text of the email document.

Preferably at least one of the text processing steps includes an analysis of the punctuation used in the text. Also preferably, at least one of the text processing steps includes an analysis of the paragraph and sentence segmentation used in the text.

In a preferred embodiment the results of the linguistic analysis, the punctuation analysis and the paragraph and sentence segmentation are represented by one or more data structures associated with segments of the text. Preferably the segments of the text are lines of the text, although in other embodiments alternative segments are used.

Preferably at least one of the text processing steps further includes utilizing a machine learning system that is responsive to the one or more data structures. In a preferred embodiment the data structures are feature vectors and the machine learning system utilizes any one or more of the following techniques:

Conditional Random Fields;

Support Vector Machines;

Naïve Bayes;

Decision Trees; and/or

Maximum Entropy.

Preferably the machine learning system has been trained with reference to a representative sample of email documents in which at least a proportion of the email documents are contemporary. As used in this document, the concept of a "contemporary email document" should be construed as being an email document that was originally authored within the preceding two year period.

A preferred embodiment includes a step of processing the text to determine the presence of header text and categorizing any such header text as non-author composed text. This preferred embodiment also includes a step of processing the email document to determine the presence of any attachments and stripping any such attachments from the email document prior to processing the text. Another step taken by this preferred embodiment relates to processing the email document to determine the presence of any forwarded material and stripping any such forwarded material from the email document prior to processing the text. Yet another step taken by the preferred embodiment relates to processing the email document to ascertain whether the email document is in a preferred format and, if the email document is not in the preferred format, converting at least some of the information within the email document to the preferred format.

In another aspect of the present invention there is provided a computer-readable medium containing computer executable code for instructing a computer to perform a method in accordance with the first aspect of the present invention.

In yet another aspect of the present invention there is provided a downloadable or remotely executable file or combination of files containing computer executable code for instructing a computer to perform a method in accordance with the first aspect of the present invention.

In a yet further aspect of the present invention there is provided a computing apparatus having a central processing unit, associated memory and storage devices, and input and output devices, said apparatus being configured to perform a method according to the first aspect of the present invention.

The features and advantages of the present invention will become further apparent from the following detailed description of preferred embodiments, provided by way of example only, together with the accompanying drawings.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

Figure 1 is a flow chart illustrating the main processing steps carried out by a preferred embodiment of the invention;

Figure 2 is a schematic depiction of a typical email document; and

Figure 3 is a schematic depiction of a preferred embodiment of a computing apparatus according to the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

A preferred example of the process flow of the inventive method 1 is depicted in figure 1. The first step 2 of the method 1 is to import an email document 3 to be parsed. A typical email document 3 may include some or all of a number of different sections, as shown schematically in figure 2. These sections may consist of, for example, a link 4 to one or more attachments, a header 5, a body 6, a signature block 7, some automatically appended advertisement materials 8 and/or an embedded reply chain of previous email messages 9. It will be appreciated that the ordering and number of occurrences of these various sections 4 to 9 may vary from that depicted in figure 2. With the exception of the link to an attachment 4, each of the sections 5 to 9 are at least initially coded by the processing computer as a single block of text, with the divisions between the various sections being typically initially unknown to the processing computer. In other words, the header 5, body 6, signature block 7, advertisement 8 and the embedded reply chain 9 are typically all encoded as a single unparsed text field.

In some embodiments each email 3 is imported and parsed in real time immediately after receipt or interception. In other embodiments, a database of received or intercepted emails is maintained and each email 3 is imported from the database as required, either immediately after receipt, or at some later point in time. In the preferred embodiment, an original copy of the email 3 is stored for later reference, and all analysis takes place upon a copy of the original.

It will be appreciated that the actual hardware platform upon which the invention is implemented will vary depending upon the amount of processing power required. In some embodiments the computing apparatus is a stand alone computer, whilst in other embodiments the computing apparatus is formed from a networked array of interconnected computers.

The preferred embodiment utilizes a computing apparatus 50 as shown in figure 3, which is configured to perform the parsing processing. This computing apparatus includes a computer 51 having a central processing unit (CPU); associated memory, in particular RAM and ROM; storage devices such as hard drives, writable CD ROMS and flash memory. The computer 51 is also communicatively connected via a wireless network hub 52 to an email server 53, a database server 54 and a laptop computer 56, which functions as a user interface to the networked hardware. The laptop computer 56 provides the user with input devices such as a keyboard 57 and a mouse (not illustrated); and a display in the form of a screen 58. The laptop computer 56 is also communicatively connected via the wireless network hub 52 to an output device in the form of a printer 59. The email server 53 includes an external communications link in the form of a modem. Email messages 3 are received by the email server 55 and relayed via the wireless network hub 52 to the computer 51 for parsing. Depending upon user requirements, a copy of the email 3 may also be stored on the database server 54.

For the sake of a running example, the processing of the following exemplary email document shall be described:

```
-----Original Message-----
From: Commercial Services
Sent: Monday, May 08, 2006 3:23 PM
To: 'jbloggs@hotmail.com'
Subject: RE: Special Request

Hi Joe,

Thank you for inquiring about our Commercial Services
program. Thank you for
your recent Commercial Services inquiry. The B&W Commercial
Services
program can give you one-stop convenience for all of your
upkeep and
commercial improvement needs, including online change of
address and utilities
connections with the QC product. Here is the link to access
this
information: http://commercialservices.bw.com. The vendors
are listed
by category and their contact information is also available
on-line. In
order to receive quotes on the services you've requested,
it is advised
to directly contact that vendor as Commercial Services does
not have access to
pricing information.

If you require any moving services, however, please feel
free to browse
our website for our movers' information and then call us at
888.572.9427
so that we can set up an appointment for an estimate.

If you have any questions, please don't hesitate to email
or call at
888.572.9427.

Best Regards,
The Commercial Services Team
```

```
888.572.9427
commercialservices@bw.com


-----Original Message-----
From: jbloggs@hotmail.com [mailto:jbloggs@hotmail.com]
Sent: Monday, May 08, 2006 3:13 PM
To: Commercial Services
Subject: Special Request

BW Commercial Services - Special Request

Submitted________________________________________
     Time:  5/8/2006 4:12:32 PM

Origins__________________________________________
     Origin:  Our Site
     Origin 2:

Message from____________________________________
     Name:  Joe Bloggs
     E-mail:  jbloggs@hotmail.com
     Phone:  (507) 359-7891
     Additional Phone:
     Contact Method:  phone
     Contact Time:  Evening (5:00 pm - 8:00 pm)
     Contact ASAP:  Yes

Customer responses_______________________________
     I'm interested in renting, and I would like:
          More information on your Commercial Services
program


B&W - Your Favorite Commercial Services Provider Since 1875
```

In the preprocessing step 10 the email 3 is processed to determine the presence of any header text 5 (excluding any header text that may be within the embedded reply chain) or attachments 4, including attached email documents, if any. This preprocessing is relatively straight forward for those skilled in the art. It may be thought of as a basic “cleaning up” of the email 3 prior to more sophisticated parsing. In some embodiments the preprocessing step 10 takes place in real time immediately prior to the parsing steps described below. In other embodiments, the preprocessing 10 takes place separately from the remaining steps, for example when a copy of the email 3 is saved on the database server 54 for future parsing.

Once the header text 5, attachments 4 or other forwarded materials have been identified in the preprocessing step 10, these components of the email 3 are categorized by the computer 51 as non-author composed text. In the preferred embodiment the recordal of such categorization is achieved by inserting annotations into the text, for example by:

inserting the tag "<header>" at the commencement of the header 5; and

inserting the tag "</header>" at the conclusion of the header 5.

As applied to the running example, this results in the following annotated header text 5:

```
<header>-----Original Message-----
From: Commercial Services
Sent: Monday, May 08, 2006 3:23 PM
To: 'jbloggs@hotmail.com'
Subject: RE: Special Request</header>
```

Alternative embodiments record the categorization by means other than by inserting annotations into the text. In one such embodiment, the text that has been categorized is copied into a memory location or bulk storage location that is exclusively reserved for the relevant category of text. In yet another embodiment the appearance of the categorized text is altered, for example by altering the background or foreground colour or font of the categorized text. In a further embodiment the annotations are stored in an annotation repository, along with pointer data indicating the positions within the text of the email 3 to which the annotation is applicable. It will be appreciated that many other means for recording the categorization of text may be devised by those skilled in the art. In further alternative embodiments, any header text 5, attachments 4 or other forwarded materials are simply stripped from the version of the email 3 that progresses to the further parsing steps.

Subsequent to preprocessing 10, the process flow of the parsing computer 51 moves to the step of normalization 11. This entails processing the email document 3 to ascertain whether it is in a preferred format and, if the email document 3 is not in the preferred format, converting at least some of the information within the email document to the preferred format. More particularly, the imported emails 3 may be in any one of a variety of character sets and encodings, for example US-ASCII, UTF-8, ISO-8859-1, ISO-8859-2, ISO-8859-6, windows-1251, windows-1252 or windows-1256. Occasionally documents may have headers which specify an incorrect encoding (e.g. a UTF-8 document may have a header claiming it is ISO-8859-1). In such cases, a set of heuristics are used to guess at the correct encoding. Once the encoding is known, all text in formats other than UTF-8 is converted to UTF-8 so as to provide a single consistent format for the parsing to follow. Of course, formats other than UTF-8 are used as preferred formats in other embodiments.

The process flow of the parsing computer 51 now progresses through several analysis steps, referred to as the segmentation step 12, the linguistic analysis step 13 and the punctuation analysis step 14. The results of these analysis steps 12 to 14 are recorded in suitable memory or storage means accessible to the CPU of the parsing computer 51. In the segmentation step 12 the text of email 3 is split into paragraphs, and the paragraphs are split into sentences. In the preferred embodiment this segmentation analysis 12 is performed by a publicly available third party tool, known as the General Architecture for Text Engineering (GATE) segmentation tool, which is distributed by The University of Sheffield. Other third party segmentation tools, such those provided by Stanford University, may also be utilised.

The preferred embodiment records segmentation using annotations inserted in the text. As applied to the running example, this results in the following annotated email text:

```
<header>-----Original Message-----
From: Commercial Services
Sent: Monday, May 08, 2006 3:23 PM
To: 'jbloggs@hotmail.com'
Subject: RE: Special Request</header>

<paragraph>Hi Joe,</paragraph>

<paragraph><sentence>Thank you for inquiring about our
Commercial Services program.</sentence><sentence>Thank you
for your recent Commercial Services
inquiry.</sentence><sentence>The B&W Commercial Services
program can give you one-stop convenience for all of your
upkeep and commercial improvement needs, including online
change of address and utilities connections with the QC
product.</sentence><sentence>Here is the link to access
```

```
this information:
http://commercialservices.bw.com.</sentence><sentence>The
vendors are listed by category and their contact
information is also available on-
line.</sentence><sentence>In order to receive quotes on the
services you've requested, it is advised to directly
contact that vendor as Commercial Services does not have
access to pricing information.</sentence></paragraph>

<paragraph><sentence>If you require any moving services,
however, please feel free to browse our website for our
movers' information and then call us at 888.572.9427 so
that we can set up an appointment for an
estimate.</sentence></paragraph>

<paragraph><sentence>If you have any questions, please
don't hesitate to email or call at
888.572.9427.</sentence></paragraph>

<paragraph>Best Regards,
The Commercial Services Team
888.572.9427
commercialservices@bw.com</paragraph>

<paragraph>-----Original Message-----
From: jbloggs@hotmail.com [mailto:jbloggs@hotmail.com]
Sent: Monday, May 08, 2006 3:13 PM
To: Commercial Services
Subject: Special Request</paragraph>

<paragraph>BW Commercial Services - Special
Request</paragraph>

<paragraph>Submitted_______________________________________
_
     Time:  5/8/2006 4:12:32 PM</paragraph>

<paragraph>Origins_________________________________________
_
     Origin:  Our Site
     Origin 2:</paragraph>

<paragraph>Message from____________________________________
     Name:  Joe Bloggs
     E-mail:  jbloggs@hotmail.com
     Phone:  (507) 359-7891
     Additional Phone:
     Contact Method:  phone
```

```
    Contact Time:  Evening (5:00 pm - 8:00 pm)
    Contact ASAP:  Yes </paragraph>

<paragraph>Customer
responses_______________________________
<sentence>I'm interested in renting, and I would
like:</sentence>
<sentence>More information on your Commercial Services
program</sentence></paragraph>

<paragraph>B&W - Your Favorite Commercial Services Provider
Since 1875</paragraph>
```

Following segmentation analysis, the parsing computer 51 performs linguistic analysis of the words in the text at step 13. This analysis includes identification of predefined words and phrases of various types. An exemplary list of some of the types of words and phrases that are identified in this stage of the analysis is set out in table 1.

Word or Phrase Type	**Examples**
peoples' names	"James", "Jane"
Locations	"Sydney", "United Arab Emirates"
Dates	"23/10/2006", "Monday the 23rd of June"
times	"noon", "12:30pm"
organizations	"Microsoft", "IBM"
Currency	"$20", "£16"
uniform resource locators (URL's)	"http://www.google.com"
email addresses	"joe.blogg@domain.com"
addresses	"29 High Street"

organizational descriptors	“Dept.”, “Division”
phone numbers	+61 2 9476 0477
typical greetings	“Hi”, “Dear”
typical farewells	“Best regards”, “Cheers”

Table 1

The preferred embodiment has an extensive database of examples of such types of words and phrases, which functions as a lexicon to assist in the identification of such key words and phrases. This data is stored in database server 54. In the preferred embodiment the results of the linguistic analysis are inserted as annotations into the text in the manner described above. As applied to the running example, this results in the following annotated email text (for the sake of clarity only some of the possible annotations are shown here):

```
<header>-----Original Message-----
From: <Organization>Commercial Services</Organization>
Sent: <Date>Monday, May 08, 2006</Date> <Time>3:23
PM</Time>
To: '<Email>jbloggs@hotmail.com</Email>'
Subject: RE: Special Request</header>

<paragraph>Hi <Person>Joe</Person>,</paragraph>

<paragraph><sentence>Thank you for inquiring about our
<Organization>Commercial Services</Organization>
program.</sentence> <sentence>Thank you for your recent
<Organization>Commercial Services</Organization>
inquiry.</sentence> <sentence>The <Organization>B&W
Commercial Services</Organization> program can give you
one-stop convenience for all of your upkeep and commercial
improvement needs, including online change of address and
utilities connections with the QC product.</sentence>
<sentence>Here is the link to access this information:
<Url>http://commercialservices.bw.com</Url>.</sentence>
<sentence>The vendors are listed by category and their
contact information is also available on-line.</sentence>
<sentence>In order to receive quotes on the services you've
requested, it is advised to directly contact that vendor as
```

```
<Organization>Commercial Services</Organization> does not
have access to pricing information.</sentence></paragraph>

<paragraph><sentence>If you require any moving services,
however, please feel free to browse our website for our
movers' information and then call us at
<Phone>888.572.9427</Phone> so that we can set up an
appointment for an estimate.</sentence></paragraph>

<paragraph><sentence>If you have any questions, please
don't hesitate to email or call at
<Phone>888.572.9427</Phone>.</sentence></paragraph>

<paragraph>Best Regards,
The <Organization>Commercial Services</Organization> Team
<Phone>888.572.9427</Phone>
<Email>commercialservices@bw.com</Email></paragraph>

<paragraph>-----Original Message-----
From: <Email>jbloggs@hotmail.com</Email>
[mailto:<Email>jbloggs@hotmail.com</Email>]
Sent: <Date>Monday, May 08, 2006</Date> <Time>3:13
PM</Time>
To: <Organization>Commercial Services</Organization>
Subject: Special Request</paragraph>

<paragraph><Organization>BW Commercial
Services</Organization> - Special request</paragraph>

<paragraph>Submitted_____________________________________
_
     Time:  <Date>5/8/2006</Date> <Time>4:12:32
PM</Time></paragraph>

<paragraph>Origins_______________________________________
_
     Origin:  Our Site
     Origin 2:</paragraph>

<paragraph>Message from__________________________________
     Name:  <Person>Joe Bloggs</Person>
     E-mail:  <Email>jbloggs@hotmail.com</Email>
     Phone:  <Phone>(507) 359-7891</Phone>
     Additional Phone:
     Contact Method:  phone
     Contact Time:  Evening (<Time>5:00 pm</Time> -
<Time>8:00 pm</Time>)
     Contact ASAP:  Yes </paragraph>
```

```
<paragraph>Customer
responses_______________________________
<sentence>I'm interested in renting, and I would
like:</sentence>
<sentence>More information on your <Organization>Commercial
Services</Organization> program</sentence></paragraph>

<paragraph><Organization>B&W<Organization> - Your Favorite
<Organization>Commercial Services</Organization> Provider
Since 1875</paragraph>
```

Punctuation analysis takes place at step 14 of the process flow. In this step the parsing computer 51 analyses the text at the character level so as to check for use of sentence punctuation marks and other predefined characters, such as:

special markers, e.g. two hyphens "--" (which often indicate that an email signature follows);

the greater-than character ">" (which often indicate the presence of reply lines);

quotation marks (which may signal the presence of a quotation);

emoticons (e.g. ":-)", ":o)") (which are typically indicative of either an emotive state of the author, or an emotive state that the author wishes to elicit from the recipient of the email).

At the completion of the analysis steps 12 to 14, the process flow proceeds to step 15, in which the analysed email document, including any annotations that have been inserted, is saved into the memory of the computing apparatus, along with any extraneous results of the analysis.

Steps 16 and 17 are optional and relate to the anonymisation of the document. This entails stripping some of the text identified in the linguistic analysis step 13, such as the names of people, locations, phone numbers, URLs, and emails addresses so as to remove any information that may identify one or more parties associated with the email. This typically entails stripping text from the body 6 of the email 3, and also from any signatures 7 and headers 5. For many applications it is not necessary to anonymise the email text, in which case steps 16 and 17 are omitted and the parsing processing instead proceeds directly from step 15 to step 18.

To summarise the results of the processing that has occurred to this point a number of features are defined at step 18. Typically, a feature is a descriptive statistic calculated from either or both of the raw text and the annotations. For example, a feature might express the ratio of frequencies of two different annotation types (e.g. the ratio of sentence annotations to paragraph annotations), or the presence or absence of an annotation type (e.g. greeting). More particularly, the features can be generally divided into three groupings:

- Character level features - which summarise the analysis of each individual character in the text of the email. Typically the results of the punctuation analysis step 14 provide the majority of these features. Examples include:
    - proportion of characters that are:
        - alphabetic,
        - numeric,
        - white space,
        - punctuation, and
        - special symbols;
    - proportion of words with less than four characters; and
    - mean word length.
- Lexical level features – which summarise the keywords and phrases, emoticons, multiword prepositional phrases, farewell expressions, greeting expressions, part-of-speech tags, etc. identified during the linguistic analysis step 13. Examples include:
    - frequency and distribution of different parts of speech;
    - word type-token ratio;
    - frequency distribution of specific function words drawn from the keyword database; and
    - frequency distribution of multiword prepositions; and proportion of words that are function words.
- Structural level features – which typically refer to the annotations made regarding structural features of the text such as the presence of a signature block, reply status, attachments, headers, etc. Examples include information regarding:
    - indentation of paragraphs;
    - presence of farewells;

- document length in characters, words, lines, sentences and/or paragraphs; and
- mean paragraph length in lines, sentences and/or words.

Information regarding the categories, descriptions and names of the various features that are calculated for a typical email document 3 in the preferred embodiment is set out in the following table:

Feature Category	**Feature Description**	**Feature Name**
CHARACTERS		
	All chars	Char_count_all
		Char_ratio_inWord_all
alpha	Alpha chars	Char_ratio_alpha_all
upperCase	Upper case chars	Char_ratio_upperCase_all
		Char_ratio_upperCase_alpha
lowerCase	Lower case chars	
digit	Lower case chars	Char_ratio_digit_all
whiteSpace	White spaces	Char_ratio_space_whiteSpace
		Char_ratio_whiteSpace_all
space	Spaces	Char_ratio_space_all
tab	Tabs	Char_count_tab
		Char_ratio_tab_all
		Char_ratio_tab_whiteSpace
punctuation	Punctuation	Char_count_punctuation
		Char_ratio_punctuation_all
alphabeticA through alphabeticZ	character A, etc.	Char_count_alphabeticA, etc.
punc44	punctuation character ,	Char_count_punc44
punc46	punctuation character .	Char_count_punc46
punc63	punctuation character ?	Char_count_punc63
punc33	punctuation character !	Char_count_punc33
punc58	punctuation character :	Char_count_punc58
punc59	punctuation character ;	Char_count_punc59
punc39	punctuation character '	Char_count_punc39

punc34	punctuation character "	Char_count_punc34
specialChar126	special character ~	Char_count_specialChar126
specialChar64	special character @	Char_count_specialChar64
specialChar35	special character #	Char_count_specialChar35
specialChar36	special character $	Char_count_specialChar36
specialChar37	special character %	Char_count_specialChar37
specialChar94	special character	Char_count_specialChar94
specialChar38	special character &	Char_count_specialChar38
specialChar42	special character *	Char_count_specialChar42
specialChar45	special character -	Char_count_specialChar45
specialChar95	special character _	Char_count_specialChar95
specialChar61	special character =	Char_count_specialChar61
specialChar43	special character +	Char_count_specialChar43
specialChar60	special character <	Char_count_specialChar60
specialChar62	special character >	Char_count_specialChar62
specialChar91	special character [	Char_count_specialChar91
specialChar93	special character]	Char_count_specialChar93
specialChar123	special character {	Char_count_specialChar123
specialChar125	special character }	Char_count_specialChar125
specialChar92	special character \	Char_count_specialChar92
specialChar47	special character /	Char_count_specialChar47
specialChar124	special character |	Char_count_specialChar124
WORDS		
Word	All word Tokens	Word_count_all
		Word_meanLengthIn_Char
		Word_ratio_wordType_all
shortWord	Short words of length less than 4 characters	Word_ratio_shortWord_all
functionWord	Function words from predefined lexicon such as: up, to	Word_ratio_functionWord_all
wordLength	Intermediate entities consisting of entities having various word lengths 1-30 characters	Word_ratio_wordLen1_all, etc.
posTag	Intermediate entities consisting of entities of various part-of-speech types	Word_ratio_posTag_all

posNN	Words its part-of-speech equal NN	Word_ratio_posNN_all
posVBT	Words its part-of-speech equal VBT	Word_ratio_posVBT_all
posVBU	Words its part-of-speech equal VBU	Word_ratio_posVBU_all
posIN	Words its part-of-speech equal IN	Word_ratio_posIN_all
posJJ	Words its part-of-speech equal JJ	Word_ratio_posJJ_all
posRB	Words its part-of-speech equal RB	Word_ratio_posRB_all
posPR	Words its part-of-speech equal PR	Word_ratio_posPR_all
posNNP	Words its part-of-speech equal NNP	Word_ratio_posNNP_all
posPOS	Words its part-of-speech equal POS	Word_ratio_posPOS_all
posMD	Words its part-of-speech equal MD	Word_ratio_posMD_all
caseUpper	Words of character case type upper	Word_ratio_caseUpper_all
caseLower	Words of character case type lower	Word_ratio_caseLower_all
caseCamel	Words of character case type camel	Word_ratio_caseCamel_all
caseFirstUpper	Words of character case type firstUpper	Word_ratio_caseFirstUpper_all
caseSlowShiftRelease	Words of character case type slowShiftRelease	Word_ratio_caseSlowShiftRelease_all
caseSingletonUpper	Words of character case type singletonUpper	Word_ratio_caseSingletonUpper_all
CorrelateEducated	Words correlating with author trait Educated	Word_ratio_CorrelateEducated_all
CorrelateFemale	Words correlating with author trait Female	Word_ratio_CorrelateFemale_all
CorrelateHighAgreeableness	Words correlating with author trait HighAgreeableness	Word_ratio_CorrelateHighAgreeableness_all
CorrelateHighConscientiousness	Words correlating with author trait HighConscientiousness	Word_ratio_CorrelateHighConscientiousness_all
CorrelateHighExtraversion	Words correlating with author trait HighExtraversion	Word_ratio_CorrelateHighExtraversion_all
CorrelateHighNeuroticism	Words correlating with author trait HighNeuroticism	Word_ratio_CorrelateHighNeuroticism_all
CorrelateHighOpenness	Words correlating with author trait HighOpenness	Word_ratio_CorrelateHighOpenness_all
CorrelateLowAgreeableness	Words correlating with author trait LowAgreeableness	Word_ratio_CorrelateLowAgreeableness_all
CorrelateLowConscientiousness	Words correlating with author trait LowConscientiousness	Word_ratio_CorrelateLowConscientiousness_all
CorrelateLowExtraversion	Words correlating with author trait LowExtraversion	Word_ratio_CorrelateLowExtraversion_all
CorrelateLowNeuroticism	Words correlating with author trait LowNeuroticism	Word_ratio_CorrelateLowNeuroticism_all
CorrelateLowOpenness	Words correlating with author trait LowOpenness	Word_ratio_CorrelateLowOpenness_all

CorrelateMale	Words correlating with author trait Male	Word_ratio_CorrelateMale_all
CorrelateNonUS	Words correlating with author trait NonUS	Word_ratio_CorrelateNonUS_all
CorrelateOld	Words correlating with author trait Old	Word_ratio_CorrelateOld_all
CorrelateUneducated	Words correlating with author trait Uneducated	Word_ratio_CorrelateUneducated_all
CorrelateUS	Words correlating with author trait US	Word_ratio_CorrelateUS_all
CorrelateYoung	Words correlating with author trait Young	Word_ratio_CorrelateYoung_all
Wordclasses	all wordclasses annotations	Word_ratio_wordClass_all
wordclassesSP	wordclass spelling error (SP)	Word_ratio_wordClassSP_all
wordclassesTP	wordclass typing error (TP)	Word_ratio_wordClassTP_all
wordclassesCF	wordclass creative wordformation (CF)	Word_ratio_wordClassCF_all
wordclassesAB	wordclass abbreviation (AB)	Word_ratio_wordClassAB_all
wordclassesWS	wordclass missing whitespace (WS)	Word_ratio_wordClassWS_all
wordclassesGR	wordclass grammatical error (GR)	Word_ratio_wordClassGR_all
wordclassesFW	wordclass foreign word (FW)	Word_ratio_wordClassFW_all
MULTIWORD PREPOSITIONS		
MultiwordPrepositions	All multiword prepositions (mwp)	MultiwordPreposition_count_all MultiwordPreposition_ratio_all_allWords MultiwordPreposition_meanLengthIn_Word MultiwordPreposition_meanLengthIn_Char
mwp0 through mwp19	mwp's from predefined lexicon	MultiwordPreposition_ratio_mwp1_all
FUNCTION WORDS		
FunctionWord	All annotations of function words	FunctionWord_count_all
function0 through 149	Annotations matching function word lexicon	FunctionWord_ratio_function0_all, etc.
GREETINGS		
Greeting	All annotations of greeting words	Greeting_count_all
greeting0 through greeting86	Annotations matching greeting lexicon	Greeting_count_greeting0, etc.
FAREWELLS		
Farewell	All annotations of farewell words	Farewell_count_all

farewell0 through farewell186	Annotations matching farewell lexicon	Farewell_count_farewell0, etc.
EMOTICONS		
Emoticon	All annotations representing emoticon symbols	Emoticon_count_all
emoticon0 through emoticon70	Annotations matching emoticon lexicon	Emoticon_count_emoticon0, etc.
LINES		
Line	All lines strings	Line_count_all
		Line_meanLengthIn_Char
blank	Blank lines	Line_ratio_blank_all
SENTENCES		
Sentence	All sentence annotations	Sentence_count_all
		Sentence_meanLengthIn_Char
		Sentence_meanLengthIn_Word
PARAGRAPHS		
Paragraph	All paragraph annotations	Paragraph_count_all
		Paragraph_meanLengthIn_Char
		Paragraph_meanLengthIn_Word
		Paragraph_meanLengthIn_Sentence
indented	Paragraphs with the first line indented	Paragraph_ratio_indented_all
HTML		
html	HTML annotations, and annotations concerning the HTML	HTML_count_all
		HTML_ratio_all_allWords
		HTML_meanLengthIn_Char
		HTML_meanLengthIn_Word
htmlTag	Intermediate entities consisting of entities of various HTML tags	HTML_ratio_htmlTag_all
htmlFontAttributeSize1 through Size7	HTML font tag with attribute size = 1, etc.	HTML_ratio_htmlFontAttributeSize1_htmlTag, etc.
htmlFontAttributeSize-1	HTML font tag with attribute size = -1	HTML_ratio_htmlFontAttributeSize-1_htmlTag
htmlFontAttributeSize+1	HTML font tag with attribute size = +1	HTML_ratio_htmlFontAttributeSize+1_htmlTag
htmlFontAttributeSize-2	HTML font tag with attribute size = -2	HTML_ratio_htmlFontAttributeSize-2_htmlTag
htmlFontAttributeColorNavy	HTML font tag with attribute color = navy	HTML_ratio_htmlFontAttributeColorNavy_htmlTag

htmlFontAttributeColorTeal	HTML font tag with attribute color = teal	HTML_ratio_htmlFontAttributeColorTeal_htmlTag
htmlFontAttributeColorLime	HTML font tag with attribute color = lime	HTML_ratio_htmlFontAttributeColorLime_htmlTag
htmlFontAttributeColorGreen	HTML font tag with attribute color = green	HTML_ratio_htmlFontAttributeColorGreen_htmlTag
htmlFontAttributeColorSilver	HTML font tag with attribute color = silver	HTML_ratio_htmlFontAttributeColorSilver_htmlTag
htmlFontAttributeColorFuchsia	HTML font tag with attribute color = fuchsia	HTML_ratio_htmlFontAttributeColorFuchsia_htmlTag
htmlFontAttributeColorWhite	HTML font tag with attribute color = white	HTML_ratio_htmlFontAttributeColorWhite_htmlTag
htmlFontAttributeColorYellow	HTML font tag with attribute color = yellow	HTML_ratio_htmlFontAttributeColorYellow_htmlTag
htmlFontAttributeColorBlack	HTML font tag with attribute color = black	HTML_ratio_htmlFontAttributeColorBlack_htmlTag
htmlFontAttributeColorPurple	HTML font tag with attribute color = purple	HTML_ratio_htmlFontAttributeColorPurple_htmlTag
htmlFontAttributeColorOlive	HTML font tag with attribute color = olive	HTML_ratio_htmlFontAttributeColorOlive_htmlTag
htmlFontAttributeColorRed	HTML font tag with attribute color = red	HTML_ratio_htmlFontAttributeColorRed_htmlTag
htmlFontAttributeColorMaroon	HTML font tag with attribute color = maroon	HTML_ratio_htmlFontAttributeColorMaroon_htmlTag
htmlFontAttributeColorAqua	HTML font tag with attribute color = aqua	HTML_ratio_htmlFontAttributeColorAqua_htmlTag
htmlFontAttributeColorGray	HTML font tag with attribute color = gray	HTML_ratio_htmlFontAttributeColorGray_htmlTag
htmlFontAttributeColorBlue	HTML font tag with attribute color = blue	HTML_ratio_htmlFontAttributeColorBlue_htmlTag
htmlFontAttributeColorOther	HTML font tag with attribute color = other	HTML_ratio_htmlFontAttributeColorOther_htmlTag
htmlFontAttributeFaceArial	HTML font tag with attribute face = arial	HTML_ratio_htmlFontAttributeFaceArial_htmlTag
htmlFontAttributeFaceVerdana	HTML font tag with attribute face = verdana	HTML_ratio_htmlFontAttributeFaceVerdana_htmlTag
htmlFontAttributeFaceTahoma	HTML font tag with attribute face = tahoma	HTML_ratio_htmlFontAttributeFaceTahoma_htmlTag
htmlFontAttributeFaceGaramond	HTML font tag with attribute face = garamond	HTML_ratio_htmlFontAttributeFaceGaramond_htmlTag
htmlFontAttributeFaceGeorgia	HTML font tag with attribute face = georgia	HTML_ratio_htmlFontAttributeFaceGeorgia_htmlTag
htmlFontAttributeFaceWingdings	HTML font tag with attribute face = wingdings	HTML_ratio_htmlFontAttributeFaceWingdings_htmlTag
htmlFontAttributeFacePapyrus	HTML font tag with attribute face = papyrus	HTML_ratio_htmlFontAttributeFacePapyrus_htmlTag
htmlFontAttributeFaceDefault	HTML font tag with attribute face = default	HTML_ratio_htmlFontAttributeFaceDefault_htmlTag
htmlTagB	HTML <B> tags	HTML_ratio_htmlTagB_htmlTag

htmlTagI	HTML <I> tags	HTML_ratio_htmlTagI_htmlTag
htmlTagSTRONG	HTML <STRONG> tags	HTML_ratio_htmlTagSTRONG_htmlTag
htmlTagU	HTML <U> tags	HTML_ratio_htmlTagU_htmlTag
htmlTagTT	HTML <TT> tags	HTML_ratio_htmlTagTT_htmlTag
htmlTagSMALL	HTML <SMALL> tags	HTML_ratio_htmlTagSMALL_htmlTag
htmlTagBIG	HTML <BIG> tags	HTML_ratio_htmlTagBIG_htmlTag
htmlTagEM	HTML <EM> tags	HTML_ratio_htmlTagEM_htmlTag
htmlTagTABLE	HTML <TABLE> tags	HTML_ratio_htmlTagTABLE_htmlTag
htmlTagTR	HTML <TR> tags	HTML_ratio_htmlTagTR_htmlTag
htmlTagTD	HTML <TD> tags	HTML_ratio_htmlTagTD_htmlTag
htmlTagHR	HTML <HR> tags	HTML_ratio_htmlTagHR_htmlTag
htmlTagCENTER	HTML <CENTER> tags	HTML_ratio_htmlTagCENTER_htmlTag
htmlTagLI	HTML <LI> tags	HTML_ratio_htmlTagLI_htmlTag
htmlTagUL	HTML <UL> tags	HTML_ratio_htmlTagUL_htmlTag
AUTHOR_TEXT		
AuthorText	All author text annotations	AuthorText_count_all
REPLY		
Reply	All reply annotations	Reply_count_all
SIGNATURE		
Signature	All signature annotations	Signature_count_all
PERSONAL		
personal	all category personal annotations	personal_count_all
PROFESSIONAL		
professional	all category professional annotations	professional_count_all
BUSINESS		
business	all category business annotations	business_count_all
TIME		
Time	All Time annotations	Time_count_all
		Time_ratio_all_allWords
		Time_meanLengthIn_Char
		Time_meanLengthIn_Word

time24	Time annotations such as 23:15 or 08:15	Time_ratio_time24_all
timeAMPM	Time annotations having am or pm tokens e.g. 8:15 am	Time_ratio_timeAMPM_all
timeOClock	Time annotations such as 5 o'clock	Time_ratio_timeOClock_all
timeAmbiguous	Time annotations that are ambiguous e.g. 8:15	Time_ratio_timeAmbiguous_all
MONEY		
Money	All Money annotations	Money_count_all
		Money_ratio_all_allWords
		Money_meanLengthIn_Char
		Money_meanLengthIn_Word
hasDollarSign	Money annotations having a dollar sign e.g. $5.0	Money_ratio_hasDollarSign_all
PERSON		
Person	All Person annotations	Person_count_all
		Person_ratio_all_allWords
		Person_meanLengthIn_Char
		Person_meanLengthIn_Word
hasTitle	Person annotations having a title e.g. Mr. John Smith	Person_ratio_hasTitle_all
DATE		
Date	All Date annotations	Date_count_all
		Date_ratio_all_allWords
		Date_meanLengthIn_Char
		Date_meanLengthIn_Word
dateNum	Date annotations with numeric month component	Date_ratio_dateNum_all
dateWorded	Date annotations with worded month component	Date_ratio_dateWorded_all
hasDay	Date annotations with a day specified	Date_ratio_hasDay_all
hasYear	Date annotations with a year specified	Date_ratio_hasYear_all
dateUK	Numeric Date annotations written in UK format e.g. 30/12/2005	Date_ratio_dateUK_dateNum
dateUS	Numeric Date annotations written in US format e.g. 12/30/2005	Date_ratio_dateUS_dateNum
dateAmbiguous	Numeric Date annotations with ambiguous(US or UK) style e.g. 5/6/2005	Date_ratio_dateAmbiguous_dateNum

monthDate	Worded Date annotations with month before date e.g. July 7th	Date_ratio_monthDate_dateWorded
dateMonth	Worded Date annotations with date before month e.g. 7th of July	Date_ratio_dateMonth_dateWorded
ADDRESS		
Address	all address annotations	Address_count_all
		Address_meanLengthIn_Char
		Address_meanLengthIn_Word
		Address_ratio_all_allWords
EMAIL		
Email	all email annotations	Email_count_all
		Email_meanLengthIn_Char
		Email_meanLengthIn_Word
		Email_ratio_all_allWords
LOCATION		
Location	all location annotations	Location_count_all
		Location_meanLengthIn_Char
		Location_meanLengthIn_Word
		Location_ratio_all_allWords
ORGANIZATION		
Organization	all organization annotations	Organization_count_all
		Organization_meanLengthIn_Char
		Organization_meanLengthIn_Word
		Organization_ratio_all_allWords
PERCENT		
Percent	all percent annotations	Percent_count_all
		Percent_meanLengthIn_Char
		Percent_meanLengthIn_Word
		Percent_ratio_all_allWords
PHONE		
Phone	all phone annotations	Phone_count_all
		Phone_meanLengthIn_Char
		Phone_meanLengthIn_Word
		Phone_ratio_all_allWords

URL		
Url	all url annotations	Url_count_all Url_meanLengthIn_Char Url_meanLengthIn_Word Url_ratio_all_allWords

It will be appreciated by those skilled in the art that in the above feature list "char" is short for "character" and the numbers after the terms "punc" and "specialChar" refer to the American Standard Code for Information Interchange (ASCII). Hence, for example, the feature Char_count_punc33 is a numeric value equal to the number of times ASCII code 33 (i.e. !) is used in the document being parsed. Some of the other features mentioned in the above list are counts and/or ratios associated with user-defined lexicons of commonly used emoticons, farewells, function words, greetings and multiword prepositions. Each of the feature names is a variable that is set to a numeric value that is calculated for the respective feature. For example, for an email comprised of 488 characters, the feature char_count_all is set to a value of 488.

At step 19 the features extracted at step 18 are converted into data structures associated with segments of the text. The type of data structure chosen must be suitable for use with the type of machine learning system that will be used in step 20. The preferred embodiment uses feature vectors as the preferred data structure and makes use of the Conditional Random Fields technique in the machine learning system. Each of the feature vectors is associated with a line of the text of the email 3. A feature vector is essentially a list of features that is structured in a predefined manner to function as input for the Conditional Random Field processing that occurs at the next step.

At step 20 the machine learning system, using the Conditional Random Fields technique, receives the feature vectors and associated lines of text as input and is responsive to that input so as to categorise each line of text as broadly falling into one of two categories: author composed text or non- author composed text. More specifically, the category of non-author composed text is divided into five sub-categories as follows:

1. signature text 7;
2. automatically appended advertisement text 8;
3. quotation text;

4. text contained in an embedded reply chain of email messages 9; and
5. header text 5.

In the preferred embodiment, if the text does not fall into any of these five sub-categories of non-author composed text, it is categorized as author composed text. Since header text 5 is typically identified in the preprocessing step 10, the machine learning categorization step 20 focuses upon identifying the other four sub-categories of non-author composed text.

Once the parsing is complete, the results are stored in accordance with a storage protocol. The preferred embodiment once again makes use of annotations, as described in detail above, to record the results of the parsing. The identified sub-categories of non-author composed text are denoted by the following tags: <header>, <quote>, <signature>, <reply> and <advert>. The text that does not fall into any of these non-author composed sub-categories is categorized as author composed text and is annotated with the following tag: <AuthorText>. With reference to the running example, the annotated text reads as follows:

```
<header>-----Original Message-----
From: <Organization>Commercial Services</Organization>
Sent: <Date>Monday, May 08, 2006</Date> <Time>3:23
PM</Time>
To: '<Email>jbloggs@hotmail.com</Email>'
Subject: RE: Special Request</header>

<AuthorText><paragraph>Hi <Person>Joe</Person>,</paragraph>

<paragraph><sentence>Thank you for inquiring about our
<Organization>Commercial Services</Organization>
program.</sentence> <sentence>Thank you for your recent
<Organization>Commercial Services</Organization>
inquiry.</sentence> <sentence>The <Organization>B&W
Commercial Services</Organization> program can give you
one-stop convenience for all of your upkeep and commercial
improvement needs, including online change of address and
utilities connections with the QC product.</sentence>
<sentence>Here is the link to access this information:
<Url>http://commercialservices.bw.com</Url>.</sentence>
<sentence>The vendors are listed by category and their
contact information is also available on-line.</sentence>
<sentence>In order to receive quotes on the services you've
requested, it is advised to directly contact that vendor as
<Organization>Commercial Services</Organization> does not
```

```
have access to pricing information.</sentence></paragraph>

<paragraph><sentence>If you require any moving services,
however, please feel free to browse our website for our
movers' information and then call us at
<Phone>888.572.9427</Phone> so that we can set up an
appointment for an estimate.</sentence></paragraph>

<paragraph><sentence>If you have any questions, please
don't hesitate to email or call at
<Phone>888.572.9427</Phone>.</sentence></paragraph>

<paragraph>Best Regards,
<signature>The <Organization>Commercial
Services</Organization> Team
<Phone>888.572.9427</Phone>
<Email>commercialservices@bw.com</Email></signature></parag
raph></AuthorText>

<reply><paragraph>-----Original Message-----
From: <Email>jbloggs@hotmail.com</Email>
[mailto:<Email>jbloggs@hotmail.com</Email>]
Sent: <Date>Monday, May 08, 2006</Date> <Time>3:13
PM</Time>
To: <Organization>Commercial Services</Organization>
Subject: Special Request</paragraph>

<paragraph><Organization>BW Commercial
Services</Organization> - Special request</paragraph>

<paragraph>Submitted__________________________________________
_
     Time:  <Date>5/8/2006</Date> <Time>4:12:32
PM</Time></paragraph>

<paragraph>Origins____________________________________________
_
     Origin:  Our Site
     Origin 2:</paragraph>

<paragraph>Message from____________________________________
     Name:  <Person>Joe Bloggs</Person>
     E-mail:  <Email>jbloggs@hotmail.com</Email>
     Phone:  <Phone>(507) 359-7891</Phone>
     Additional Phone:
     Contact Method:  phone
     Contact Time:  Evening (<Time>5:00 pm</Time> -
<Time>8:00 pm</Time>)
```

```
     Contact ASAP:  Yes </paragraph>

<paragraph>Customer
responses_______________________________
<sentence>I'm interested in renting, and I would
like:</sentence>
<sentence>More information on your <Organization>Commercial
Services</Organization>
program</sentence></paragraph></reply>

<advert><paragraph><Organization>B&W<Organization> - Your
Favorite <Organization>Commercial Services</Organization>
Provider Since 1875</paragraph></advert>
```

The above annotated email text represents an example of a structured document 21, which is the final output of the preferred method 1. Note that not all of the annotations generated during steps 12 to 14 are included in the output of the method 1, for example some of the annotations associated with character level features are not included.

Other embodiments are specifically tailored to recognize further sub-categories of non-authored text, however it has been appreciated by the inventors of the present invention that identification of the five sub-categories of non-author composed text that are set out above is sufficient to identify the vast bulk of non-author composed text present in a typical representative sample of email messages as at the priority date of this patent application. In other words, restricting the identification of non-authored text to the five sub-categories set out above represents a workable compromise between accuracy and processing requirements.

The machine learning system makes use of a predictive model that is established during a training phase, in which the machine learning system receives training data consisting of pairs of feature vectors and lines statuses, where the status of a line can be any one of: author composed text 6; automatically appended advertisement text 8; signature text 7; embedded reply chain text 9 or quotation text. The training data is compiled from a representative sample of email documents 3, at least some of which are preferably contemporary. Once sufficient training iterations have been completed, the machine learning system formulates the predictive model that is used in the machine learning categorization of step 20.

In addition to, or as an alternative to, the Conditional Random Fields technique, various other preferred embodiments make use of one or more of the following types of known machine learning techniques, including:

Support Vector Machines;

Nave Bays;

Decision Trees; and/or

Maximum Entropy.

It will be appreciated by those skilled in the art that the present invention may be embodied in computer software in the form of executable code for instructing a computer to perform the inventive method. The software and its associated data are capable of being stored upon a computer-readable medium in the form of one or more compact disks (CD's). Alternative embodiments make use of other forms of digital storage media, such as Digital Versatile Discs (DVD's), hard drives, flash memory, Erasable Programmable Read-Only Memory (EPROM), and the like. Alternatively the software and its associated data may be stored as one or more downloadable or remotely executable files that are accessible via a computer communications network such as the internet.

Hence, the processing of email text undertaken by the preferred embodiment advantageously identifies advertisements and quotations in addition to reply lines, signatures and text written by the author. This parsing may be performed with a comparatively high degree of accuracy. It is achieved with the use of a rich set of linguistic features, such as a database storing a plurality of named entities, common greetings and farewell phrases. The parsing also makes use of a comprehensive set of punctuation features. Additionally, the use of segmentation analysis provides further useful input to the parsing processing, for example to help avoid incorrectly categorizing half of a sentence as author composed text and the other half of a sentence as a reply line. The preferred embodiment can advantageously function with input email text represented in a variety of formats. Advantageously, alternative preferred embodiments are configurable for use in parsing email text expressed in languages other than English. Provided the machine learning system is regularly re-trained on a contemporary set of training data, the preferred embodiment can effectively keep abreast of newly emergent email writing styles and expressions. This assists in maintaining a comparatively high degree of accuracy as the email writing genre evolves over time.

While a number of preferred embodiments have been described, it will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A computer implemented method of parsing an email document so as to categorize text from the email document as author composed text or non-author composed text, said method including the steps of:

processing the text to determine the presence of signature text and categorizing any such signature text as non-author composed text;

processing the text to determine the presence of automatically appended advertisement text and categorizing any such automatically appended advertisement text as non-author composed text;

processing the text to determine the presence of quotation text and categorizing any such quotation text as non-author composed text;

processing the text to determine the presence of text contained in an embedded reply chain of email messages and categorizing any such text contained in an embedded reply chain of email messages as non-author composed text; and

categorizing at least some of the remaining text as author composed text.

2. A method according to claim 1 wherein at least one of the text processing steps includes a linguistic analysis of the words in the text.

3. A method according to claim 2 wherein said linguistic analysis includes identification of predefined words and phrases.

4. A method according to claim 3 wherein said words and phrases include any one or more of the following types:

peoples' names, locations, dates, times, organizations, currency, uniform resource locators (URL’s), email addresses, addresses, organizational descriptors, phone numbers, typical greetings and/or typical farewells.

5. A method according to claim 4 further including a database of words and phrases of any one or more of the following types:

peoples' names, locations, dates, times, organizations, currency, uniform resource locators (URL's), email addresses, addresses, organizational descriptors, phone numbers, typical greetings and/or typical farewells.

6. A method according to claim 4 or 5 further including the step of anonymising information contained within the text of the email document.

7. A method according to any one of the preceding claims wherein at least one of the text processing steps includes an analysis of the punctuation used in the text.

8. A method according to any one of the preceding claims wherein at least one of the text processing steps includes an analysis of the paragraph segmentation used in the text.

9. A method according to any one of the preceding claims wherein at least one of the text processing steps includes an analysis of the sentence segmentation used in the text.

10. A method according to claim 1 wherein at least one of the text processing steps includes any one or more of:

a linguistic analysis of the words in the text,
an analysis of the punctuation used in the text;
an analysis of the paragraph segmentation used in the text; and/or
an analysis of the sentence segmentation used in the text,

and wherein the results of said analyses are represented by one or more data structures associated with segments of the text.

11. A method according to claim 10 wherein said segments of the text are lines of the text.

12. A method according to claim 10 or 11 wherein at least one of the text processing steps further includes utilising a machine learning system that is responsive to said one or more data structures.

13. A method according to claim 12 wherein the data structures are feature vectors and the machine learning system utilizes any one or more of the following techniques:

Conditional Random Fields;
Support Vector Machines;
Naïve Bayes;
Decision Trees; and/or
Maximum Entropy.

14. A method according to claim 12 or 13 wherein the machine learning system has been trained with reference to a representative sample of email documents.

15. A method according to claim 14 wherein the representative sample of email documents includes a proportion of contemporary email documents.

16. A method according to any one of the preceding claims including a step of processing the text to determine the presence of header text and categorizing any such header text as non-author composed text.

17. A method according to any one of the preceding claims including a step of processing the email document to determine the presence of any attachments and stripping any such attachments from the email document prior to processing the text.

18. A method according to any one of the preceding claims including a step of processing the email document to determine the presence of any forwarded material and stripping any such forwarded material from the email document prior to processing the text.

19. A method according to any one of the preceding claims including a step of processing the email document to ascertain whether the email document is in a preferred format and, if the email document is not in the preferred format, converting at least some of the information within the email document to the preferred format.

20. A computer-readable medium containing computer executable code for instructing a computer to perform a method according to any one of the preceding claims.

21. A downloadable or remotely executable file or combination of files containing computer executable code for instructing a computer to perform a method according to any one of claims 1 to 19.

22. A computing apparatus having a central processing unit, associated memory and storage devices, and input and output devices, said apparatus being configured to perform a method according to any one of claims 1 to 19.

Dated: 5 April, 2007

Appen Pty Limited,
By Their Patent Attorneys,
ADAMS PLUCK

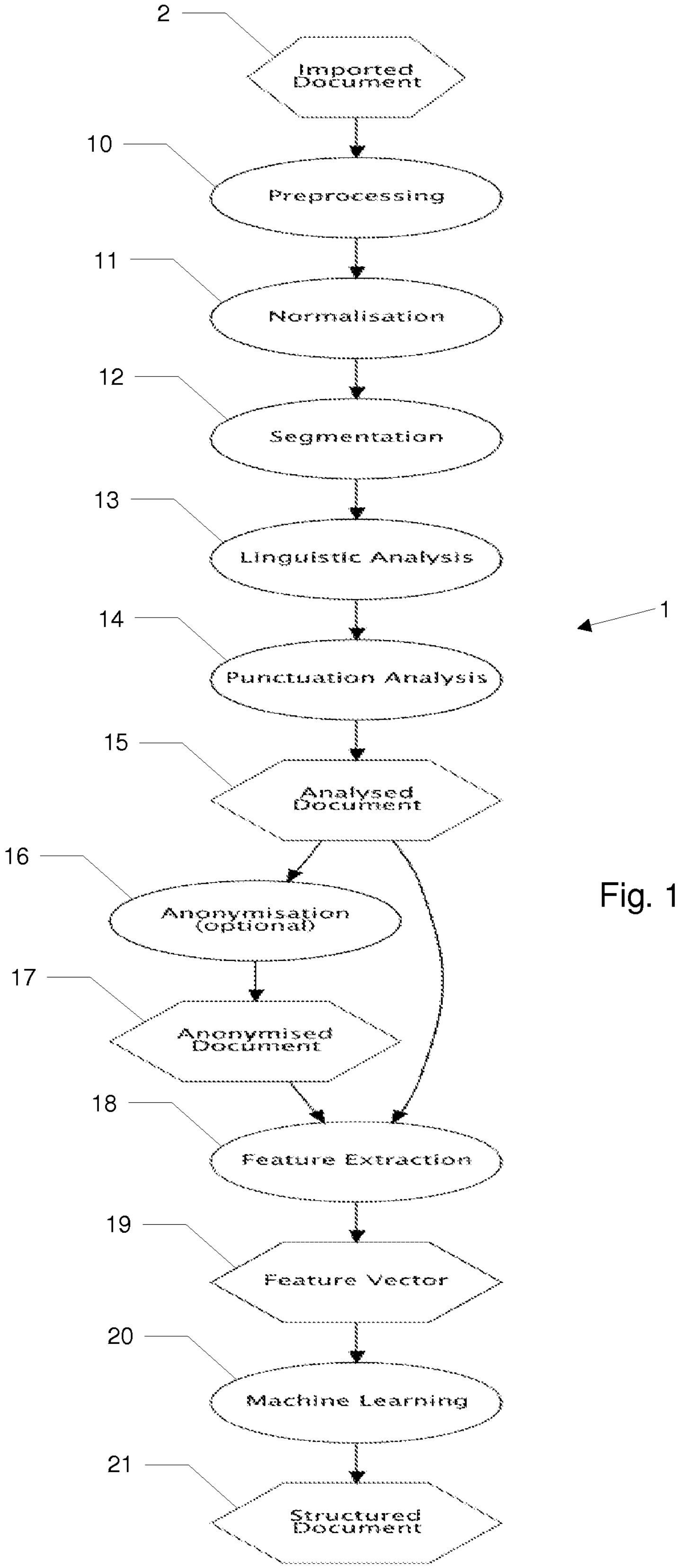
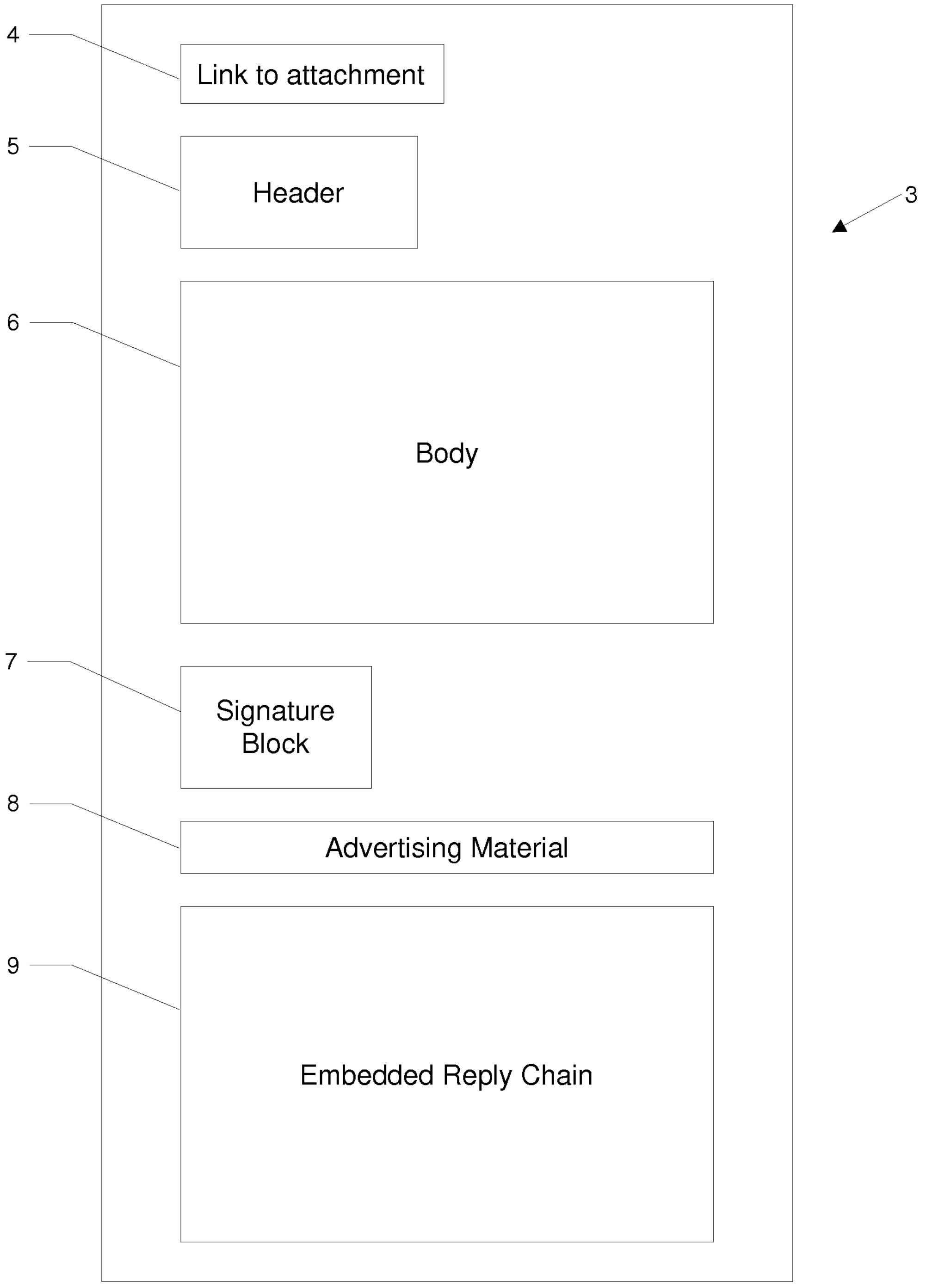

2
Imported Document
10
Preprocessing
11
Normalisation
12
Segmentation
13
Linguistic Analysis
1
14
Punctuation Analysis
15
Analysed Document
16
Anonymisation (optional)
17
Anonymised Document
18
Feature Extraction
19
Feature Vector
20
Machine Learning
21
Structured Document

Fig. 1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5
Header
3
6
Body
7
Signature Block
8
Advertising Material
9
Embedded Reply Chain

Fig. 2

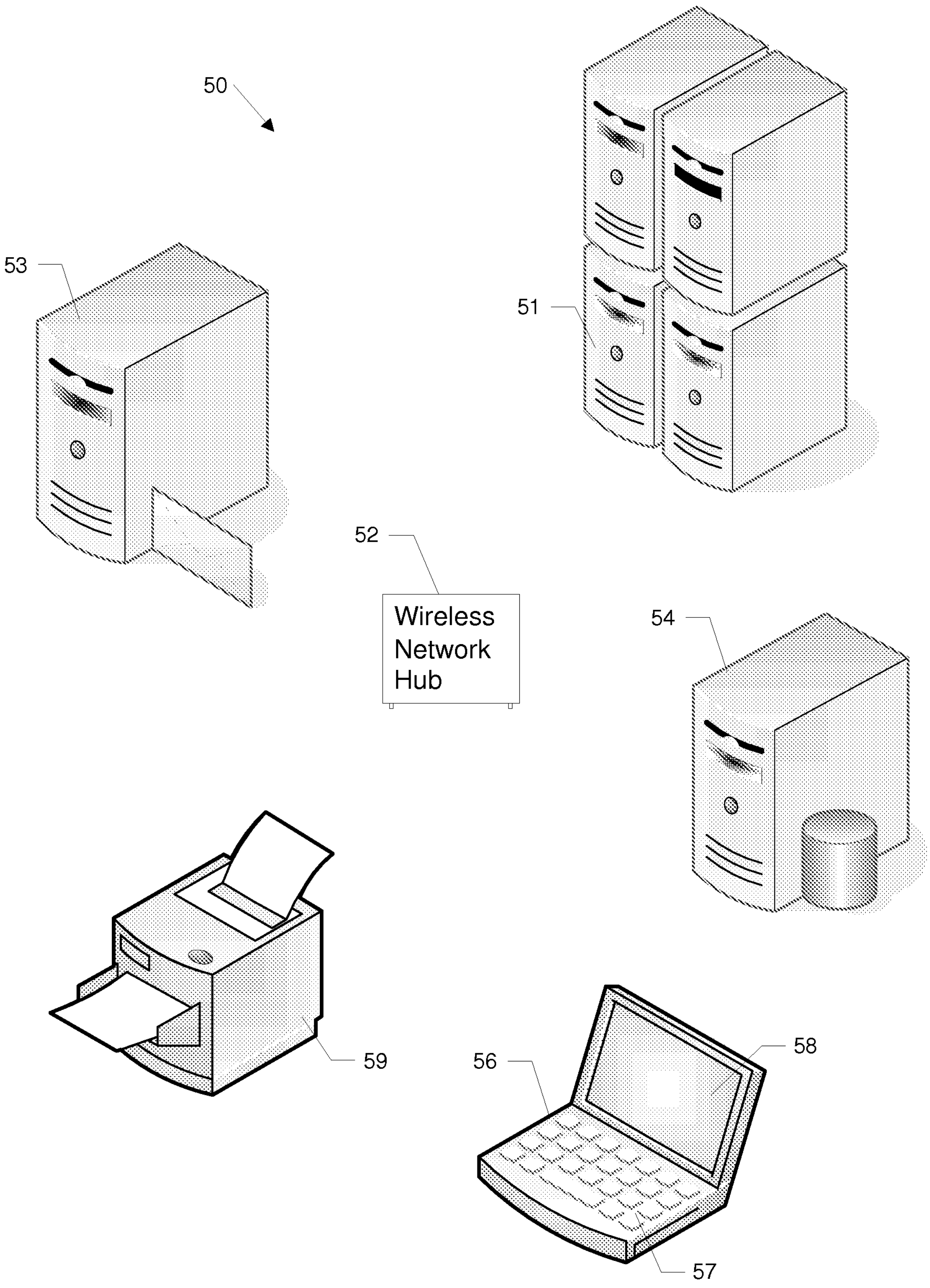

Fig. 3