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(54) SYSTEM, METHOD AND COMPUTER PROGRAM TO BLOCK SPAM

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(57) **ABSTRACT**

A system, method and program product for blocking unwanted e-mails. An e-mail is identified as unwanted. A source IP address of the unwanted e-mail is determined. Other source IP addresses owned or registered by an owner or registrant of the source IP address of the unwanted e-mail are determined. Subsequent e-mails from the source IP address and the other IP addresses are blocked. This will thwart a spammer who shifts to a new source IP address when its spam is blocked from one source IP address.

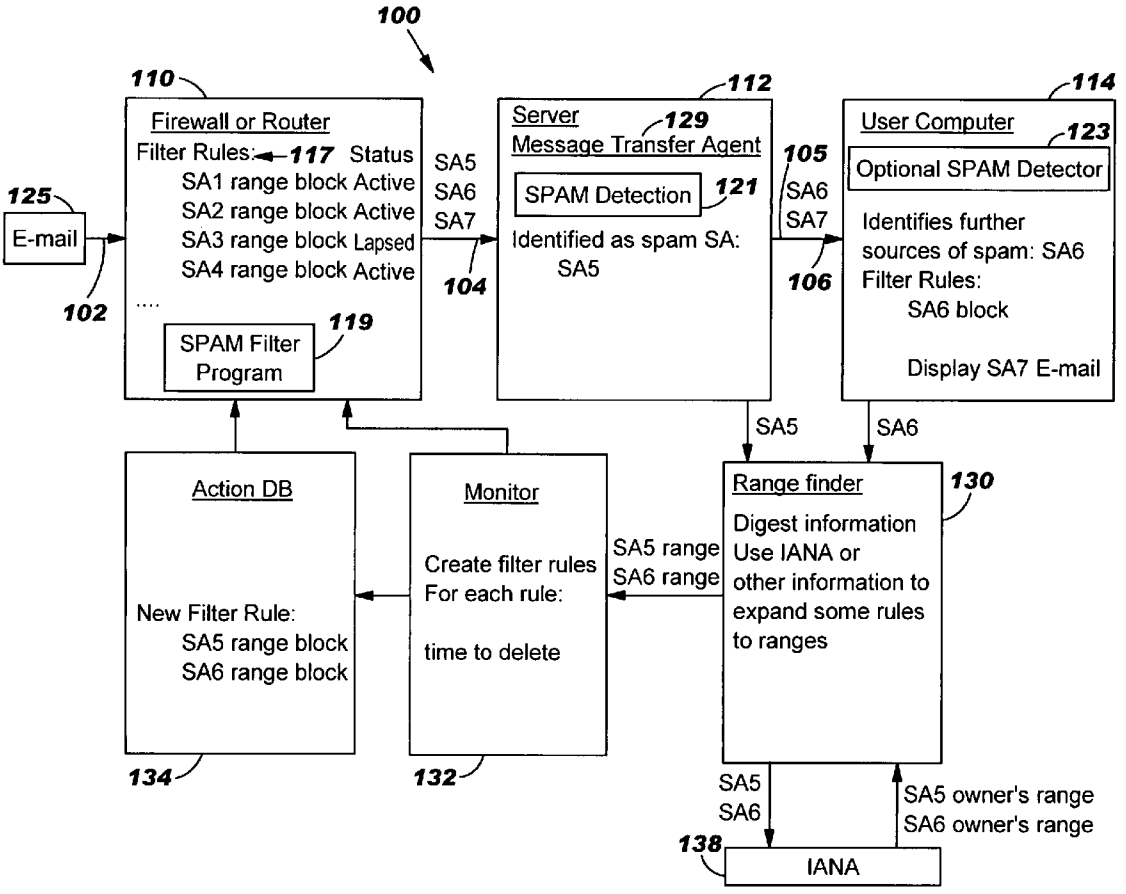


FIG. 1

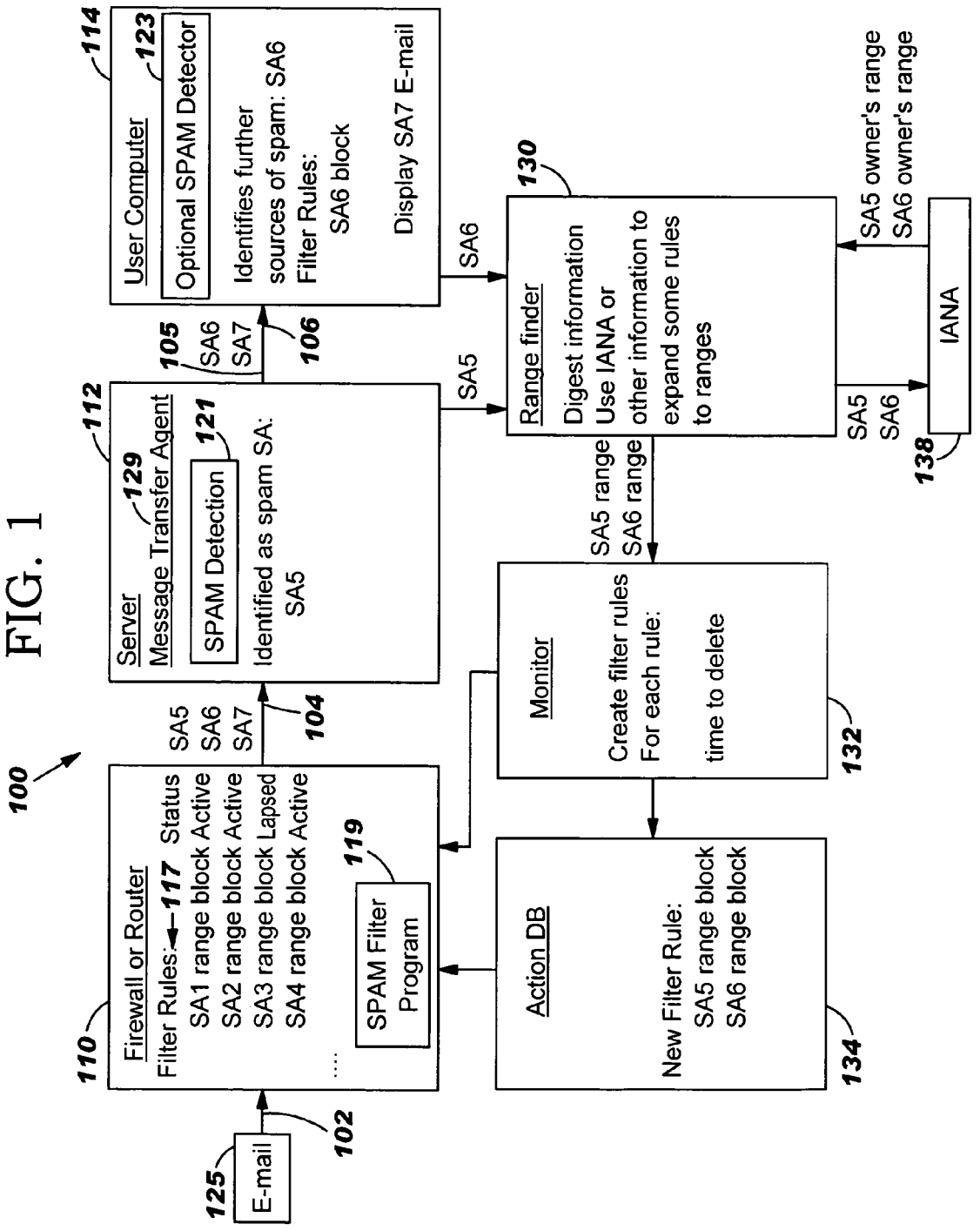

100
User Computer
123
Optional SPAM Detector
Identifies further sources of spam: SA6
Filter Rules:
SA6 block
Display SA7 E-mail
114
105
SA6
SA7
106
SA6
130
Range finder
Digest information
Use IANA or other information to expand some rules to ranges
SA5 owner's range
SA6 owner's range
SA5
SA6
138
IANA
Server
Message Transfer Agent
129
SPAM Detection
121
Identified as spam SA:
SA5
112
SA5
SA5 range
SA6 range
Monitor
Create filter rules
For each rule:
time to delete
132
SA5
SA6
SA7
104
Firewall or Router
Filter Rules:
117
Status
SA1 range block Active
SA2 range block Active
SA3 range block Lapsed
SA4 range block Active
....
119
SPAM Filter Program
110
Action DB
New Filter Rule:
SA5 range block
SA6 range block
134
E-mail
125
102

FIG. 2A

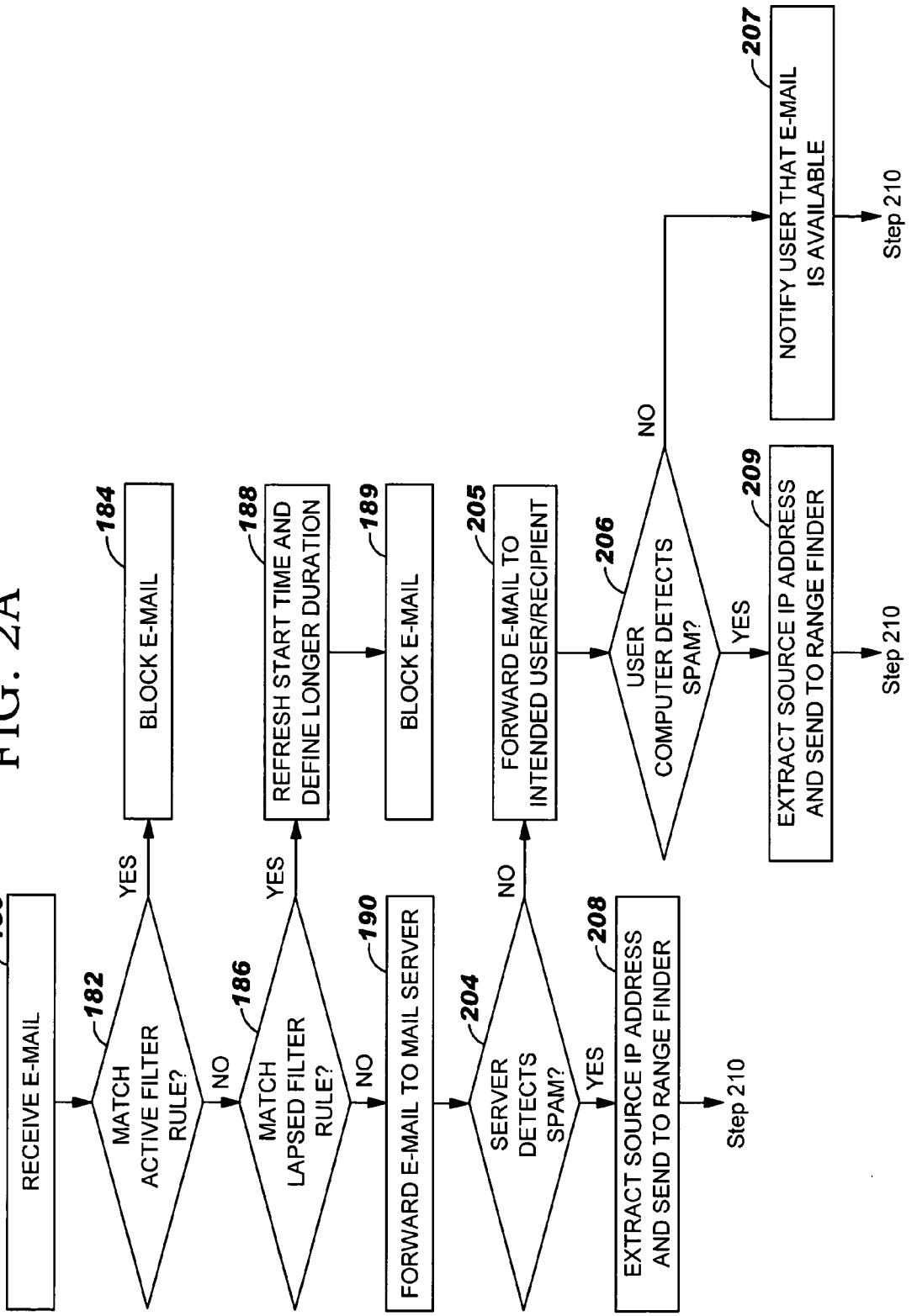
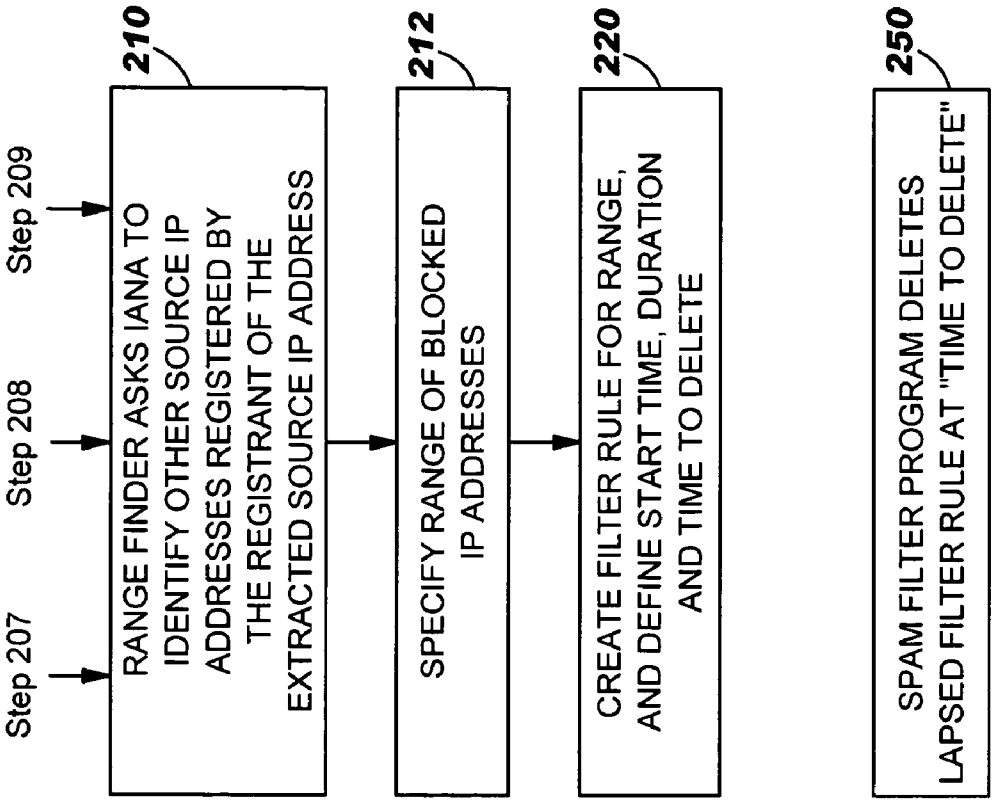

180
RECEIVE E-MAIL
182
MATCH ACTIVE FILTER RULE?
YES
184
BLOCK E-MAIL
NO
186
MATCH LAPSED FILTER RULE?
YES
188
REFRESH START TIME AND DEFINE LONGER DURATION
189
BLOCK E-MAIL
NO
190
FORWARD E-MAIL TO MAIL SERVER
204
SERVER DETECTS SPAM?
NO
205
FORWARD E-MAIL TO INTENDED USER/RECIPIENT
206
USER COMPUTER DETECTS SPAM?
NO
207
NOTIFY USER THAT E-MAIL IS AVAILABLE
Step 210
YES
209
EXTRACT SOURCE IP ADDRESS AND SEND TO RANGE FINDER
Step 210
YES
208
EXTRACT SOURCE IP ADDRESS AND SEND TO RANGE FINDER
Step 210

FIG. 2B


Step 207
Step 208
Step 209
210
RANGE FINDER ASKS IANA TO IDENTIFY OTHER SOURCE IP ADDRESSES REGISTERED BY THE REGISTRANT OF THE EXTRACTED SOURCE IP ADDRESS
212
SPECIFY RANGE OF BLOCKED IP ADDRESSES
220
CREATE FILTER RULE FOR RANGE, AND DEFINE START TIME, DURATION AND TIME TO DELETE
250
SPAM FILTER PROGRAM DELETES LAPSED FILTER RULE AT "TIME TO DELETE"

SYSTEM, METHOD AND COMPUTER PROGRAM TO BLOCK SPAM

BACKGROUND OF THE INVENTION

[0001] The invention relates generally to computer systems, and deals more particularly with a technique to effectively block spam.

[0002] The Internet is well known today, and comprises a network of user computers and servers. One role of the Internet is to provide a vehicle to exchange e-mail. A common problem today is "spam", where a server sends commercial e-mails to numerous (thousands, even millions of) user computers via the Internet. The spam clogs the Internet and the mail boxes of the user computers, and wastes user time in identifying the spam and deleting it. Spam detectors and filters are well known today such as "Spam Assasin" (trademark of _____) program. Typically, a spam detector and filter are installed at an edge router or a firewall for a server. The server provides an e-mail transfer function for multiple user computers. The spam detector reviews incoming e-mail to detect when the same e-mail (i.e. same or substantially the same text) is addressed to multiple different users. The spam detector may ignore e-mails sent from entities known to be bona fide correspondents, such as employees of the same corporation to which the e-mails are sent. These entities can be recorded on a list accessible to the spam detector. But, the same e-mails sent from another entity to multiple different users are assumed to be spam. For those cases where the e-mails are assumed to be spam, the spam detector reads the IP address of the sender, and then blocks subsequent e-mails from the same IP address by creating a spam filter rule. Each spam filter rule may specify a source IP address from which e-mail will not be accepted. The filter rule is enforced at the firewall or router, or the gateway server in the absence of a firewall or router. The blockage or filter rule may be in effect for a predetermined amount of time, or can be periodically removed when there filter becomes too complex.

[0003] The problem with the foregoing spam blocking technique is that the "spammers", i.e. the servers sending the spam, learn when their e-mails are being blocked. They can learn this by observing the TCP response to each of their e-mails. In the case of an e-mail being blocked, there will not be any acknowledgment. When their e-mails are being blocked, the spammers use a different server with a different IP address or a different IP address from the same server to send the spam. This will defeat the spam filter for a time until the spam filter identifies this new IP address as that of a spammer, and then blocks subsequent e-mails from this new IP address with a new filter rule. The foregoing iterative process can continue indefinitely, with the result that the spammer succeeds in getting a large amount of spam past the spam filter (between generation of the appropriate filter rules).

[0004] An object of the present invention is to improve spam detection and blocking.

SUMMARY

[0005] The invention resides in a system, method and program product for blocking unwanted e-mails. An e-mail is identified as unwanted. A source IP address of the unwanted e-mail is determined. Other source IP addresses owned or registered by an owner or registrant of the source IP address of the unwanted e-mail are determined. Subsequent e-mails from the source IP address and the other IP addresses are blocked. This will thwart a spammer who shifts to a new source IP address when its spam is blocked from one source IP address.

[0006] According to features of the present invention, the other source IP addresses owned or registered by an owner or registrant of the source IP address of the unwanted e-mail are determined by first determining an owner or registrant of the source IP address of the unwanted e-mail. The owner or registrant of the source IP address of the unwanted e-mail and the other IP addresses owned or registered by this owner or registrant are determined by querying an entity that manages registration of IP addresses. This entity may be the Internet Assigned Number Authority. An email can be identified as unwanted when it has the same text or subject line as other e-mails sent from the same source IP address.

BRIEF DESCRIPTION OF THE FIGURES

[0007] **FIG. 1** is a block diagram illustrating a computer system which incorporates the present invention.

[0008] FIGS. **2**(A) and **2**(B) form a flow chart of a spam detection and blocking within the computer system of **FIG. 1**, according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] The present invention will now be described in detail with reference to the figures. **FIG. 1** illustrates a distributed computer system generally designated **100**. System **100** comprises a firewall or router **110**, a server **112** coupled to the firewall or router **110** in a subnet **103**, and a multiplicity of client/user computers such as computer **114** coupled to server **112** via a Local Area Network (LAN) **105**. The firewall or router **110** performs typical functions of known firewalls such as blocking e-mails with Source Addresses (SAs) known to be currently malicious. In addition, firewall or router **110** also includes a spam filter program **119** which reviews each incoming e-mail and ascertains from its header its source IP address, i.e. the IP address of the sender of the e-mail. The firewall or router **110** includes a set of filter rules **117** each defined to block e-mail from a respective IP address or range of IP addresses (typically for a finite period of time). So, if the IP address of the sender of the e-mail matches one of the filter rules (and the filter rule is still in effect), then the firewall or router **110**"blocks" the e-mail, i.e. prevents it from passing through to the server **112**. The example of **FIG. 1** illustrates four filter rules (SA**1**, SA**2**, SA**3** and SA**4**) in firewall or router **110**. Each of the filter rules blocks e-mails from a respective range of source IP addresses (for a finite period of time).

[0010] The server **112** includes a message transfer agent ("MTA") **129**, i.e. a program function which forwards e-mail, determined not to be spam, received from the firewall or router **110** to the intended recipient/user. For example, MTA **129** can be that of Postfix (trademark of Postfix Corporation) program. The server **112** also includes a known spam detector **121** such as "Spam Assassin" spam detector program. The spam detector **121** may be part of the MTA **129** or a separate program. The spam detector reviews incoming e-mail to detect when the same e-mail (i.e. the

same or substantially the same text) is addressed to multiple different recipients/users. The spam detector may ignore e-mails sent from bona fide correspondents, such as employees of a corporation to which the e-mails are sent, such that these e-mails are not considered to be spam. The "bona fide correspondents" may be recorded on a list accessible to the spam detector. But, the same e-mails sent from another entity to multiple recipients/users are assumed to be spam. The user computer **114** may also include an optional spam detector program **123** which identifies spam based on host-based screening software or preferences of the user. The source IP addresses identified by this optional spam detector program **123** result in additional filter rules (each blocking e-mail from a single IP address or range of IP addresses) that can be applied at the firewall or router **110**.

[**0011**] FIGS. **2**(A) and **2**(B) form a flow chart illustrating operation of the spam filter program **119**, spam detector **121**, optional spam detector **123**, range finder program **130** and monitor program **132** in accordance with the present invention. In step **180**, an incoming e-mail **125** is received by the firewall or router **110**. In response, the spam filter program **119** determines if the source IP address of the e-mail matches any of the active filter rules **117** (decision **182**). (Any existing filter rules **117** may have been created in previous iterations of the steps of FIGS. **2**(A) and **2**(B).) An "active" filter rule is one that has been created and started, but not yet lapsed. As explained below, when a filter rule is created, it is assigned a start time (which is usually immediate upon creation) and a duration/period during which the filter rule is active, i.e. will be enforced. If there is an active filter rule which matches the source IP address of the current e-mail, then the e-mail is blocked, i.e. it is discarded and not permitted to pass through the firewall or router **110** to the server **112** (step **184**). However, if the source IP address of the e-mail does not match any of the active filter rules **117**, or if there are no active filter rules at this time, then the spam filter program **119** determines if the source IP address of the e-mail matches a lapsed/suspended filter rule, i.e. a filter rule which has not yet been deleted but whose duration/period of activity has lapsed (decision **186**). If so, the spam filter program **119** refreshes the start time of the lapsed filter rule to the current time to make it active once again, and defines a new duration/period that was longer than the previous one, for example, twice as long or "x" minutes longer (step **188**). (In step **188**, the spam filter program **119** also resets a "time to delete" by advancing it an amount equal to the difference between the original start time and the refreshed start time. The purpose of the "time to delete" is described below.) Also, the spam filter program **119** will block this e-mail corresponding to the lapsed/suspended filter rule, and discard it so that it will not pass through the firewall or router **110** to server **112** (step **189**). Referring back to decision **186**, no branch, if the current e-mail does not match a lapsed/suspended filter rule (or an active filter rule), then firewall or router **110** passes the e-mail through to the mail server **112** with its MTA **129** and spam detector **121** (step **190**). Next, the spam detector **121** within server **112** determines if the e-mail appears to be spam, i.e. the same text as other e-mail sent by the same unknown IP source address (decision **204**). The spam detector **121** makes this determination by any of numerous well known methods such as comparing text from the same source IP address. This comparison can be made using a hash function on some or all the lines of text of the different e-mails from the same source IP address. Spam may also be assumed when the subject lines of the e-mails from the same IP address are all the same. If the e-mail does not appear to be spam, then the spam detector **121** notifies MTA **129** which forwards the e-mail to its intended recipient indicated in the header of the e-mail, such as client computer **114** (step **205**). (In the example illustrated in **FIG. 1**, e-mails with source addresses SA**5**, SA**6** and SAA were passed from the firewall or router **110** to the mail server **112**, and spam detector **121** identified the e-mail from SA**5** as spam.) However, if the e-mail appears to be spam, then the spam detector **121** extracts the source IP address of the e-mail and sends it to a range finder program **130** (step **208**). (In the example illustrated in **FIG. 1**, spam detector **121** sent source address SA**5** to range finder program **130**.)

[**0012**] Refer again to decision **204** no branch where the server **112** forwards the e-mail to the user computer **114**. (In the example illustrated in **FIG. 1**, MTA **129** forwarded e-mails with source addresses SA**6** and SAA to user computer **114**.) If the user computer **114** includes another, optional spam detector **123**, then the spam detector **123** determines if the e-mail appears to be spam, i.e. the same text as other e-mail sent by the same unknown IP source address (decision **206**). The spam detector **123** makes this determination by, for example, comparing the source IP address to a list of forbidden source IP addresses as specified by the user or an administrator. The spam detector **123** can also make this determination by searching for forbidden words in the subject line or text, where the forbidden words are specified by the user or administrator. If the e-mail does not appear to be spam, then the spam detector **123** notifies the user that the e-mail is waiting to be read (step **207**). (In the example illustrated in **FIG. 1**, spam detector **123** determined that the e-mail from source IP address SAA was not spam, and therefore, presented it to the user.) However, if the e-mail appears to be spam, then the spam detector **123** extracts the source IP address of the e-mail and sends it to the ranger finder program **130** (step **209**). (In the example illustrated in **FIG. 1**, spam detector program **123** determined that the e-mail from source IP address SA**6** was spam, and therefore, did not present the e-mail to the user, and instead send the source IP address SA**6** to the range finder program **130**.)

[**0013**] The range finder program **130** may reside in server **112** or in another server coupled to server **112** by a network. The range finder program **130** is also coupled by a network to an existing/known Internet service company called "Internet Assigned Number Authority" company or "IANA" 138 (or a similar Internet service). IANA 138 currently maintains a database of all (that is, the range 60.70.80.0 through 60.70.80.127) addresses and the entity that "owns" or registers each block of IP addresses. IANA 138 obtains its IP address ownership information based on the following process. Each entity that desires to use an IP source address on the Internet must first register it with IANA. After the spam detector **121** or spam detector **123** notifies the range finding program **130** of a suspected spammer's source IP address, the range finder program **130** contacts "IANA" (or a similar Internet service) by e-mail and supplies the source IP address of the suspected spammer. (In the example of **FIG. 1**, the range finder program supplies source IP addresses SA**5** and SA**6** to IANA, although the notification of each source IP address can be done at different times.) The range finding program **130** also asks IANA to state who owns each source IP address and what other IP addresses are owned by

this same entity (step **208**). IANA supplies the requested information from its registration database. (In the example illustrated in **FIG. 1**, IANA returns a range of source IP addresses owned/registered by the registrant of SA**5**, and a range of source IP addresses owned/registered by the registrant of SA**6**.) After receiving the information from IANA, the ranger finder program defines ranges of source IP addresses from which e-mail should be blocked (step **212**). Each "range" is a list of all the IP addresses owned by the owner of the source IP address identified as a spammer by the spam detector in step **204**. Because the entire range will be blocked, and not just the source IP address of the single spam e-mail, this will thwart block a spammer who shifts to another of its registered source IP addresses to send new spam. The "range" can be a sequential range of source IP addresses or a grouping of non-sequential source IP addresses, as the case may be. Alternately, the blocked range can be limited to a smaller range of addresses that contains the detected source IP address and are owned by the owner of the spam e-mail, where the smaller range is a size typically used for spamming, such as a range of thirty two addresses for example, 60.70.80.0 through 60.70.80.31. In another embodiment of the present invention, the range finding program **130** determines the range of blocked source IP addresses as a range of addresses (such as 60.70.80.0 through 60.70.80.256) that contain the source IP address of the spam and are not within the set of source IP addresses known by the manager of the computer system to be of interest.

[**0014**] Next, the range finding program **130** passes the ranges of blocked, source IP addresses to monitor program **132**. (In the example illustrated in **FIG. 1**, there is one range for source IP address SA**5** and another range for source IP address SA**6**.) The monitor program **132** can reside in server **112** or another server which contains the range finder program **130** (if the range finder program **130** does not reside on server **112**). Then, the monitor program **132** creates the filter rule(s) to be used by firewall or router **110** (step **220**). The filter rule(s) specifies the range of blocked, source IP addresses obtained from the range finder program **130**. For the filter rule(s), the monitor program **132** also specifies a start time to begin enforcing the filter rule and a duration/period for enforcing the filter rule as described above.

[**0015**] After defining the filter rule (including its time parameters) in step **220** for each range of blocked IP addresses, the monitor program **132** stores the filter rules in an actions database **134**, and notifies the firewall or router **110** that a new filter rule has been added to the data base. In response, the spam filter program **119** copies the new filter rule into its local data base, filter rules **117**. (In the example illustrated in **FIG. 1**, there will be new filter rules for source IP ranges SA**5** and SA**6** added to filter rules database **117**.) As explained above, when each new e-mail is received by the firewall or router **110** in step **180**, the spam filter program **119** reads all the filter rules from the database **117** to determine which are active, and therefore should be enforced (decision **182**). This decision is based on whether the current time is less than the start time of the filter rule plus the duration/period of the rule, assuming the start time is before or equal to the current time. So, during the duration/period of the rule, the spam filter program **119** enforces the filter rule, i.e. blocks e-mail with a source IP address within the specified range, so that the e-mail will not proceed to mail server **112** (step **184**). Also, as explained above, the spam filter program **119** also determines if spam has arrived from a source IP address corresponding to a lapsed/suspended filter rule, in which case the spam filter program **119** restarts/reactivates the filter rule for a longer duration/period, and blocks the current e-mail.

[**0016**] Referring again to step **220**, when a new filter rule is created, the monitor program **132** also defines a "time to delete" the filter rule (step **220**). The "time to delete" the filter rule specifies when to delete the filter rule if spam ceases from the entire range of IP addresses after the duration/period lapses, i.e. after the filter rule is suspended. Consider an example where the filter rule begins immediately, the duration/period of the filter rule is five minutes and the time to delete is fifteen minutes after start. The filter rule will go into effect immediately and last for five minutes. During those initial five minutes, all e-mails from the range of sources IP addresses specified in the filter rule will be blocked and discarded. Then, the filter rule will be "suspended" for the next ten minutes unless and until new spam is detected from any IP address within the range. If spam is detected during these ten minutes from any IP address within the range, then the filter rule is restarted/reactivated. However, if there is no spam from the entire range of IP addresses specified by the filter rule during these ten minutes, then the filter rule will be deleted altogether at the "time to delete" to "clean-out" the database of filter rules (step **250**). Step **250** is performed as follows. Whenever, a "time to delete" occurs, an interrupt or alert is sent to the spam filter program **119**. The interrupt or alert specifies the corresponding filter rule. In response to the interrupt or delete, the spam filter program **119** confirms that the corresponding filter rule is still lapsed/suspended and if so, deletes the filter rule altogether. (If the corresponding filter rule is still active at the time to delete, then an error has occurred because the original duration/period of the filter rule should have lapsed, and the time to delete should have been advanced when the filter rule was refreshed. In such a case, an administrator will be notified.)

[**0017**] Based on the foregoing, a system, method and computer program for blocking spam has been disclosed. However, numerous modifications and substitutions can be made without deviating from the scope of the present invention. For example, alternative mechanisms for identifying spam may be used. Therefore, the present invention has been disclosed by way of illustration and not limitation, and reference should be made to the following claims to determine the scope of the present invention.

1. A method of blocking unwanted e-mails, said method comprising the steps of:

identifying an e-mail as unwanted;

determining a source IP address of the unwanted e-mail;

determining other source IP addresses owned or registered by an owner or registrant of the source IP address of said unwanted e-mail; and

subsequently blocking e-mails from said source IP address and said other IP addresses.

2. A method as set forth in claim 1 wherein the step of determining other source IP addresses owned or registered by an owner or registrant of the source IP address of said

unwanted e-mail comprises the step of determining an owner or registrant of said source IP address of said unwanted e-mail.

3. A method as set forth in claim 2 wherein the step of determining other source IP addresses owned or registered by an owner or registrant of the source IP address of said unwanted e-mail is performed by querying an entity that manages registration of IP addresses.

4. A method as set forth in claim 3 wherein said entity is Internet Assigned Number Authority.

5. A method as set forth in claim 1 wherein the step of identifying an e-mail as unwanted comprises the step of identifying an e-mail which is attempted to be sent to multiple recipients where the e-mail contains the same or substantially the same text.

6. A method as set forth in claim 1 wherein the step of identifying an e-mail as unwanted comprises the step of identifying an e-mail which is attempted to be sent to multiple recipients where the e-mail contains the same or substantially the same subject line.

7. A method as set forth in claim 1 wherein the step of determining a source IP address of the unwanted e-mail comprises the step of reading the source IP address from a header of the unwanted.

8. A method as set forth in claim 1 wherein the step of subsequently blocking e-mails from said source IP address and said other IP addresses comprises the step of identifying said e-mails from said source IP address and said other IP addresses at a firewall or router, and then preventing them from passing through to a mail server(s) for their intended recipients.

9. A computer program product for blocking unwanted e-mails, said computer program product comprising:

a computer readable medium;

first program instructions to identify an e-mail as unwanted;

second program instructions to determine a source IP address of the unwanted e-mail;

third program instructions to determine other source IP addresses owned or registered by an owner or registrant of the source IP address of said unwanted e-mail; and

fourth program instructions to subsequently block e-mails from said source IP address and said other IP addresses; and wherein

said first, second, third and fourth program instructions are recorded on said medium.

10. A computer program product as set forth in claim 9 wherein said third program instructions determine an owner or registrant of said source IP address of said unwanted e-mail.

11. A computer program product as set forth in claim 10 wherein said third program instructions determine an owner or registrant of said source IP address by querying an entity that manages registration of IP addresses.

12. A computer program product as set forth in claim 11 wherein said entity is Internet Assigned Number Authority.

13. A computer program product as set forth in claim 9 wherein said first program instructions identifies an e-mail as unwanted by identifying an e-mail which is attempted to be sent to multiple recipients where the e-mail contains the same or substantially the same text.

14. A computer program product as set forth in claim 9 wherein said first program instructions identifies an e-mail as unwanted by identifying an e-mail which is attempted to be sent to multiple recipients where the e-mail contains the same or substantially the same subject line.

15. A computer program product as set forth in claim 9 wherein said second program instructions determines a source IP address of the unwanted e-mail comprises by reading the source IP address from a header of the unwanted.

16. A computer program product as set forth in claim 9 wherein said fourth program instructions blocks e-mails from said source IP address and said other IP addresses by identifying said e-mails from said source IP address and said other IP addresses at a firewall or router, and then preventing them from passing through to a mail server(s) for their intended recipients.

17. A system for blocking unwanted e-mails, said system comprising:

means for identifying an e-mail as unwanted;

means for determining a source IP address of the unwanted e-mail;

means for determining other source IP addresses owned or registered by an owner or registrant of the source IP address of said unwanted e-mail; and

means for subsequently blocking e-mails from said source IP address and said other IP addresses.

18. A system as set forth in claim 17 wherein said means for determining other source IP addresses owned or registered by an owner or registrant of the source IP address of said unwanted e-mail comprises means for determining an owner or registrant of said source IP address of said unwanted e-mail.

19. A system as set forth in claim 18 wherein said means for determining other source IP addresses owned or registered by an owner or registrant of the source IP address of said unwanted e-mail comprises means for querying an entity that manages registration of IP addresses.

20. A system as set forth in claim 19 wherein said entity is Internet Assigned Number Authority.

* * * * *