

EARLY WARNING METHOD AND SYSTEM FOR ROADHEADER REMOTE MONITORING SYSTEM

[0001] The present application claims the priority to Chinese Patent Application
5 No.201811183598.7, titled "EARLY WARNING METHOD AND SYSTEM FOR
ROADHEADER REMOTE MONITORING SYSTEM", filed on October 11, 2018 with the
National Intellectual Property Administration, PRC, which is incorporated herein by reference
in its entirety.

10 FIELD

[0002] The present disclosure relates to the technical field of roadheader monitoring, and in
particular to an early warning method and system for roadheader remote monitoring system.

BACKGROUND

[0003] At present, roadheaders are widely used in tunnel construction due to their high
15 production efficiency, fast tunneling speed, strong adaptability, and flexible movement.
Conventionally, in order to ensure the proper operation and construction safety of the
roadheader, a roadheader remote monitoring system (which can remotely monitor the
roadheader and perform fault early warning) is generally configured in an engineering system.
20 Specifically, the fault early warning process of the existing roadheader remote monitoring
system comprises: preconfiguring standard thresholds respectively corresponding to
independent parameters of the roadheader; determining whether each independent parameter
meets the standard according to the preconfigured standard threshold corresponding to the
independent parameter (the determination manner is generally a comparison between the two)
25 during the process of system's monitoring of all the parameters of the roadheader; and if the
independent parameter does not meet the standard, making the corresponding fault early
warning for the parameter that does not meet the standard. However, in the complex and
closely interconnected systems of the roadheader, this early warning strategy for only a single
independent parameter can no longer meet the early warning requirements of the roadheader.
30 Therefore, the proper operation and construction safety of the roadheader may be influenced

to a certain extend.

[0004] Therefore, how to provide solutions to the above technical issues is a task that needs to be addressed by those skilled in the art.

5 SUMMARY

[0005] An objective of the present disclosure is to provide an early warning method and system for a roadheader remote monitoring system. Compared with the early warning strategy only for a single independent parameter, the combined early warning strategy of the present disclosure can better meet the early warning requirements of the roadheader and thus
10 facilitates the proper operation of the roadheader and improves the construction safety.

[0006] To address the above technical issues, the present disclosure provides an early warning method for a roadheader remote monitoring system, comprising:

[0007] preconfiguring early warning strategies corresponding to respective parameters of a roadheader, and preconfiguring combined parameter information and early warning
15 relationships among respective parameters in the combined parameter information;

[0008] determining early warning results of the respective parameters in the combined parameter information according to the corresponding early warning strategies, during system's real-time remote monitoring of the respective parameters of the roadheader, and

[0009] determining, according to the early warning results and the early warning
20 relationships, a combined early warning result corresponding to the combined parameter information, and triggering a combined early warning when the combined early warning result meets a combined early warning trigger condition.

[0010] Preferably, the preconfiguring early warning strategies corresponding to respective parameters of a roadheader comprises:

25 **[0011]** preconfiguring standard determination strategies corresponding to respective parameters of the roadheader under different construction environments, and

[0012] when it is determined according to the standard determination strategies that the roadheader has any substandard parameter, determining that the substandard parameter meets its independent early warning trigger condition.

[0013] Preferably, the preconfiguring early warning strategies corresponding to respective parameters of a roadheader comprises:

[0014] associating any one of the parameters of the roadheader with a working state corresponding to the parameter, and

5 **[0015]** when it is determined, according to both the standard determination strategy and the working state that correspond to the parameter, that the parameter is substandard, determining that the parameter meets its independent early warning trigger condition.

[0016] Preferably, the early warning method comprises:

10 **[0017]** when any one of the parameters of the roadheader meets its independent early warning trigger condition, triggering the independent early warning corresponding to the parameter.

[0018] Preferably, the early warning method comprises:

15 **[0019]** pre-classifying the independent early warnings corresponding to the respective parameters of the roadheader according to parameter functions, to obtain a plurality of early warning types;

[0020] pre-determining responsible personnel for each of the early warning types, and assigning roles and role-levels to the responsible personnel, and

20 **[0021]** when an independent early warning is triggered, sending a corresponding early warning message by a short message platform to upper-level responsible personnel so that the upper-level responsible personnel forwards the early warning message level by level to lower-level responsible personnel.

[0022] Preferably, the early warning method comprises:

25 **[0023]** when the combined early warning is triggered, sending a corresponding early warning message by the short message platform to management personnel who triggered the combined early warning.

[0024] Preferably, the early warning method comprises:

[0025] recording the responsible personnel who receives the early warning message and the time of the receipt, and generating an early warning transfer timeline.

[0026] Preferably, the early warning method comprises:

[0027] cancelling the early warning if the relevant parameter of the roadheader is adjusted by relevant responsible personnel after the early warning is triggered.

[0028] Preferably, the early warning relationship between two parameters in the combined parameter information is AND or OR.

[0029] To address the above technical issues, the present disclosure provides an early warning system for a roadheader remote monitoring system, comprising:

[0030] an preconfiguring module, configured to preconfigure early warning strategies corresponding to respective parameters of a roadheader, and preconfigure combined parameter information and early warning relationships among respective parameters in the combined parameter information;

[0031] an early warning determining module, configured to determine early warning results of the respective parameters in the combined parameter information according to the corresponding early warning strategies, during system's real-time remote monitoring of the respective parameters of the roadheader, and

[0032] an combined early warning module, configured to determine, according to the early warning results and the early warning relationships, a combined early warning result corresponding to the combined parameter information, and triggering a combined early warning when the combined early warning result meets a combined early warning trigger condition.

[0033] The present disclosure provides an early warning method for a roadheader remote monitoring system, which comprises: preconfiguring early warning strategies corresponding to respective parameters of a roadheader, and preconfiguring combined parameter information and early warning relationships among respective parameters in the combined parameter information; determining early warning results of the respective parameters in the combined parameter information according to the corresponding early warning strategies, during system's real-time remote monitoring of the respective parameters of the roadheader; determining, according to the early warning results and the early warning relationships, a combined early warning result corresponding to the combined parameter information, and triggering a combined early warning when the combined early warning result meets a

combined early warning trigger condition.

[0034] It can be seen that, in the present disclosure, each parameter of the roadheader can be combined, and the early warning strategy corresponding to each parameter in the combined parameter information is used to determine the respective early warning result, and then the final combined early warning result is determined according to the early warning relationships among the respective parameters, so that the combined early warning is triggered when the combined early warning result meets the combined early warning trigger condition. Compared with the early warning strategy only for a single independent parameter, the combined early warning strategy of the present disclosure can better meet the early warning requirements of the roadheader and thus facilitates the proper operation of the roadheader and improves the construction safety.

[0035] The present disclosure further provides an early warning system for a roadheader remote monitoring system, which has similar beneficial effects as the above early warning method.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] The drawings to be used in the description of the embodiments or the prior art will be described briefly as follows, so that the technical solutions according to the embodiments of the present disclosure will become clearer. It is apparent that the drawings in the following description only illustrate some embodiments of the present disclosure. For those skilled in the art, other drawings may be obtained according to these drawings without any creative work.

[0037] Figure 1 shows a flow chart of an early warning method for a roadheader remote monitoring system according to the present disclosure, and

[0038] Figure 2 shows a structural schematic diagram of an early warning system for a roadheader remote monitoring system according to the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0039] The objective of the present disclosure is to provide an early warning method and system for a roadheader remote monitoring system. Compared with the early warning strategy

only for a single independent parameter, the combined early warning strategy of the present disclosure can better meet the early warning requirements of the roadheader and thus facilitates the proper operation of the roadheader and improves the construction safety.

[0040] In order to make the objectives, technical solutions, and advantages of the embodiments of the present disclosure more obvious and understandable, in the following, the technical solutions of the embodiments of the present disclosure will be described clearly and completely in conjunction with the accompanying drawings of the embodiments of the present disclosure. Obviously, the described embodiments are only part but not all of embodiments of the present disclosure. All other embodiments obtained by those skilled in the art based on these embodiments of the present disclosure without any creative work fall within the scope of protection of the present disclosure.

[0041] Reference is made to Figure 1, which shows a flow chart of an early warning method for a roadheader remote monitoring system according to the present disclosure.

[0042] The early warning method for a roadheader remote monitoring system comprises steps S1-S3.

[0043] In step S1, early warning strategies corresponding to respective parameters of a roadheader are preconfigured, and combined parameter information and early warning relationships among respective parameters in the combined parameter information are preconfigured.

[0044] Specifically, in the present disclosure, the early warning strategy corresponding to each parameter of the roadheader may be configured in advance, that is, under what conditions any one of the parameters of the roadheader meets its independent early warning trigger condition. In the present disclosure, the combination parameter information composed of multiple parameters of the roadheader may also be configured in advance (each parameter that composes the combination parameter information may be selected according to needs of a manager, that is, the manager may customize a piece of combination parameter information), and the early warning relationships among all the parameters in the combined parameter information may be configured (it is difficult to avoid some false early warnings caused by parameter value fluctuations and other unexpected factors for the single-parameter fault early

warning in the prior art, which misleads the staff of the roadheader to perform troubleshooting and thus affects the work progress. Therefore, the combination parameter information and the early warning relationships among the parameters in the combination parameter information are configured in the present disclosure, to add restrictive conditions on the main early warning parameters, so that the final early warning conditions are more refined and strict, which improves the accuracy of the early warning and prevents from false early warnings).

[0045] In step S2, during system's real-time remote monitoring of the respective parameters of the roadheader, early warning results of the respective parameters in the combined parameter information are determined according to the corresponding early warning strategies.

[0046] Specifically, in the present disclosure, functions of the roadheader remote monitoring system include: real-time remote monitoring of the roadheader's tunneling process, working states and all parameters; remote transmitting, storing and displaying of all parameters. The functions are of high efficiency and good real-time performance. Hence, in order to determine the final early warning result of the combination parameter information set above (which can be called the combined early warning result), in the present disclosure it is determined, in the process of system's real-time remote monitoring of all parameters of the roadheader, whether each parameter in the monitored combined parameter information meets its independent early warning trigger condition according to the early warning strategy corresponding to the parameter, so as to determine the early warning result of each parameter in the combined parameter information (the early warning result is that: meeting the independent early warning trigger condition may be represented by "1", and not meeting the independent early warning trigger condition may be represented by "0").

[0047] In step S3, a combined early warning result corresponding to the combined parameter information is determined according to the early warning results and the early warning relationships, and a combined early warning is triggered when the combined early warning result meets a combined early warning trigger condition.

[0048] Specifically, in the present disclosure, after the early warning result of each parameter in the combined parameter information being determined, it is determined according to the early warning relationships among the respective parameters in the combined parameter information whether the combined parameter information meets the combined

early warning trigger condition (that is, under restricted conditions, whether the main early warning parameters meet the final early warning condition), so as to determine the final combined early warning result (the combined early warning result is that meeting the combined early warning trigger condition may be represented by "1"; not meeting the combined early warning trigger condition may be represented by "0"). When the determined combined early warning result is 1, i.e., the combination early warning trigger condition is met, the combined early warning is triggered.

[0049] In view of this, compared with the early warning strategy only for a single independent parameter, the combined early warning strategy of the present disclosure can better meet the early warning requirements of the roadheader and thus facilitates the proper operation of the roadheader and improves the construction safety.

[0050] For example, the combined parameter information is composed of parameter A and parameter B, and the early warning relationship between parameter A and parameter B is that if each of parameter A and parameter B meets its independent early warning trigger condition, the combined parameter information meets the combined early warning trigger condition. In the process of system's real-time remote monitoring of all parameters of the roadheader, whether the monitored parameter A meets its independent early warning trigger condition is determined according to the early warning strategy corresponding to the parameter A (a same determination is done to parameter B). If each of parameter A and parameter B satisfies its independent early warning trigger condition, which indicates that the combined parameter information meets the combined early warning trigger condition, the combined early warning is triggered.

[0051] In the present disclosure, an early warning method for a roadheader remote monitoring system is provided, which comprises: preconfiguring early warning strategies corresponding to respective parameters of a roadheader, and preconfiguring combined parameter information and early warning relationships among respective parameters in the combined parameter information; determining early warning results of the respective parameters in the combined parameter information according to the corresponding early warning strategies, during system's real-time remote monitoring of the respective parameters of the roadheader; determining, according to the early warning results and the early warning relationships, a combined early warning result corresponding to the combined parameter

information, and triggering a combined early warning when the combined early warning result meets a combined early warning trigger condition.

[0052] It can be seen that, in the present disclosure, each parameter of the roadheader may be combined, and the early warning strategy corresponding to each parameter in the combined parameter information is used to determine the respective early warning result, and then the final combined early warning result is determined according to the early warning relationships among the respective parameters, so that the combined early warning is triggered when the combined early warning result meets the combined early warning trigger condition. Compared with the early warning strategy only for a single independent parameter, the combined early warning strategy of the present disclosure can better meet the early warning requirements of the roadheader and thus facilitates the proper operation of the roadheader and improves the construction safety.

[0053] The following embodiments are based on the above embodiment.

[0054] As a preferred embodiment, preconfiguring the early warning strategies corresponding to the respective parameters of the roadheader comprises:

[0055] preconfiguring standard determination strategies corresponding to respective parameters of the roadheader under different construction environments, and

[0056] when it is determined according to the standard determination strategies that the roadheader has any substandard parameter, determining that the substandard parameter meets its independent early warning trigger condition.

[0057] Specifically, only one standard determination strategy is generally configured for a parameter of the roadheader in the prior art. Parameter A of the roadheader is taken as an example. A standard threshold corresponding to the parameter A of the roadheader is preconfigured. During the process of monitoring parameter A of the roadheader, the monitored parameter A is compared with a set standard threshold, and whether the parameter A meets the standard is determined according to the comparison result (that is, the standard determination strategy is to compare parameter A with the corresponding standard threshold).

[0058] However, among all the parameters of the roadheader, it is reasonable only for some of the parameters to use a standard determination strategy of comparing the parameter with its corresponding standard threshold, and it is not suitable for the other parameters to use this

standard determination strategy. Accordingly, in the present disclosure, a variety of standard determination strategies are configured (e.g., whether the parameter is equal to the corresponding standard threshold, not equal to the corresponding standard threshold, greater than the corresponding standard threshold, less than the corresponding standard threshold, or
5 between two thresholds - not inclusive, or whether the number of occurrences of a certain parameter being under a condition is greater than the preconfigured number during a certain period of time), so as to be applicable to all parameters of the roadheader.

[0059] In addition, in the present disclosure, considering different construction environments, the standard determination strategy suitable for the same parameter of the
10 roadheader may be different. Thus, in the present disclosure, the process of preconfiguring the early warning strategy corresponding to each parameter of the roadheader includes: based on a variety of standard determination strategies, the standard determination strategies corresponding to each parameter of the roadheader in different construction environments are preconfigured; before the roadheader starts working, the standard determination strategy of
15 each parameter of the roadheader is determined according to the current construction environment; for any parameter of the roadheader, in the working process of the roadheader, the standard determination strategy corresponding to the parameter is used to determine whether the parameter meets the standard; when the standard is not met, the parameter is determined to meet its independent early warning trigger condition.

[0060] As a preferred embodiment, preconfiguring the early warning strategies corresponding to respective parameters of the roadheader comprises:

[0061] associating any one of the parameters of the roadheader with a working state corresponding to the parameter, and

[0062] when it is determined according to both the standard determination strategy and the
25 working state that correspond to the parameter that the parameter is substandard, determining that the parameter meets its independent early warning trigger condition.

[0063] Further, considering that it is determined whether some parameters of the roadheader meet their standards only based on the standard determination strategies corresponding to the parameters, there may be false determination. Take the thrust parameter of the roadheader as
30 an example. Generally, during the working process of the roadheader, the roadheader is considered to fail when the thrust parameter is equal to zero. However, the roadheader may be

only in a state of stopping according to the working conditions and does not fail, which causes false determination. Therefore, the early warning strategy in the present disclosure, based on the settings of the above embodiments, associates the roadheader parameter prone to be falsely determined with its corresponding working state, so that whether the parameter meets the standard is jointly determined according to both the standard determination strategy and the working state during the working process of the roadheader, thereby improving the accuracy of the early warning and avoiding the false determination of the early warning. For example, when the thrust parameter of the roadheader is equal to 0, it is determined that the thrust parameter meets the standard and does not meet its independent early warning trigger condition if the roadheader is currently in a state of stopping; and it is determined that the thrust parameter does not meet the standard and meets its independent early warning trigger condition if the roadheader is currently in a state of driving.

[0064] As a preferred embodiment, the early warning method further comprises:

[0065] when any one of the parameters of the roadheader meets its independent early warning trigger condition, triggering its independent early warning.

[0066] Further, based on the early warning strategy corresponding to each roadheader parameter set in the above embodiments (the accuracy of the independent early warning determination of a single parameter is high), while providing the combined early warning, the present disclosure also determines whether each parameter of the roadheader meets its independent early warning trigger condition according to the corresponding early warning strategy of the parameter, so that the independent early warning is triggered when the independent early warning trigger condition is met.

[0067] As a preferred embodiment, the early warning method comprises:

[0068] pre-classifying the independent early warnings corresponding to the respective parameters of the roadheader according to parameter functions, to obtain a plurality of early warning types;

[0069] pre-determining responsible personnel for each of the early warning types, and assigning roles and role-levels to the responsible personnel, and

[0070] when an independent early warning is triggered, sending a corresponding early warning message by a short message platform to upper-level responsible personnel, so that

the upper-level responsible personnel forwards the early warning message level by level to lower-level responsible personnel.

[0071] Further, in order to ensure having personnel responsible for the early warning process, in the present disclosure, the independent early warnings corresponding to the
5 respective parameters of the roadheader are pre-classified according to the corresponding functions of the respective parameters of the roadheader, to obtain multiple early warning types. In the present disclosure, the responsible personnel is pre-determined for each early warning type. Thus, when any independent early warning is triggered, the responsible personnel corresponding to the early warning type to which the independent early warning
10 belongs is specifically responsible for the follow-up process of the independent early warning, which ensures clear responsibility and guarantees safe operation of the roadheader.

[0072] Accordingly, in the present disclosure, the role and role level are assigned to each responsible personnel. When the independent early warning is triggered, the short message platform sends an early warning message corresponding to the independent early warning to
15 the upper-level responsible personnel. The upper-level responsible personnel have the rights to forward the early warning message (forward the early warning message to lower-level responsible personnel level by level) or to withhold the early warning message (not forward the early warning message). For example, if the steering deviation of the roadheader exceeds a specified value, its independent early warning is triggered. The short message platform
20 sends the independent early warning to the personnel in charge of the field measurement team, who then forward it to the specific field measurement staff and to the roadheader driver. The specific measurement staff and the roadheader driver then work together to rectify the deviation to ensure the direction of the tunneling correct.

[0073] As a preferred embodiment, the early warning method further comprises:

[0074] when the combined early warning is triggered, sending a corresponding early
25 warning message by the short message platform to management personnel who triggers the combined early warning.

[0075] Further, for the combined early warning in the present disclosure, its corresponding combined parameter information is generally configured according to the needs of upper-level
30 management personnel, so in the present disclosure the alert is sent only to the upper management personnel. That is, when the combined early warning triggered, the short

message platform sends the early warning message corresponding to the combined early warning to the manager who triggers the combined early warning. Then, the upper-level management personnel decides whether to dispatch the lower-level staff to repair the roadheader.

5 **[0076]** As a preferred embodiment, the early warning method further comprises:

[0077] recording the responsible personnel who receives the early warning message and the time of the receipt, and generating an early warning transfer timeline.

[0078] Further, in the present disclosure, the responsible personnel who receives the early warning message and the time when each person in charge receives the early warning
10 message may be recorded so as to generate an early warning transfer timeline, which vividly shows the transfer trace of the early warning and ensures clear responsibility.

[0079] As a preferred embodiment, the early warning method further comprises:

[0080] cancelling the early warning if the relevant parameter of the roadheader is adjusted by relevant responsible personnel, after the early warning is triggered.

15 **[0081]** Further, after the early warning is triggered, the relevant responsible personnel shall handle in response to the early warning in a timely manner. After the relevant responsible personnel adjusts the relevant parameters of the roadheader, the early warning can be cancelled, so that the entire process of triggering, processing and cancelling of the early warning is implemented, and the significance of the early warning is realized in a true sense
20 to ensure proper and safe construction of the roadheader. In addition, since the roadheader remote monitoring system monitors in real time, the early warning will be triggered repeatedly during the adjustment of the roadheader after the early warning was triggered. Accordingly, in the present disclosure, the corresponding adjustment time is preconfigured for each early warning. When an early warning is triggered, a timer starts and the early warning
25 will not be repeatedly triggered before the timer reaches the corresponding adjustment time.

[0082] As a preferred embodiment, the early warning relationship between two parameters in the combined parameter information is AND or OR.

[0083] Specifically, the early warning relationship between two parameters in the combined parameter information in the present disclosure may be an AND relationship (only each of the
30 two parameters meets the independent early warning trigger condition, the two parameters as

a whole will meet the early warning trigger condition), or a OR relationship (any one of the two parameters meets the independent early warning trigger condition, then the two parameters as a whole will meet the early warning trigger condition). For example, the combined parameter information is composed of parameter A, parameter B, and parameter C.

5 The early warning relationship among the three parameters are: A AND B OR C, that is, each of parameter A and parameter B meets its independent warning trigger condition (case 1), or the parameter C meets its independent early warning trigger condition (case 2). When either of the two cases is met, the combined parameter information will meet the combined early warning trigger condition.

10 **[0084]** In the present disclosure, an early warning system for a roadheader remote monitoring system is further provided, which comprises:

[0085] an preconfiguring module 1, for preconfiguring early warning strategies corresponding to respective parameters of a roadheader, and preconfiguring combined parameter information and early warning relationships among respective parameters in the
15 combined parameter information;

[0086] an early warning determining module 2, for determining early warning results of the respective parameters in the combined parameter information according to the corresponding early warning strategies, during system's real-time remote monitoring of the respective parameters of the roadheader, and

20 **[0087]** an combined early warning module 3, for determining, according to the early warning results and the early warning relationships, a combined early warning result corresponding to the combined parameter information, and triggering a combined early warning when the combined early warning result meets a combined early warning trigger condition.

25 **[0088]** The introduction of the early warning system provided in the present disclosure may refer to the above embodiments of the early warning method, which will not be repeated herein.

[0089] It should be further noted that in the present disclosure, terms "include", "comprise" or any other variations are intended to cover non-exclusive "include", so that a process, a
30 method, an object or a device including a series of factors not only include the factors, but

also include other factors not explicitly listed, or also include inherent factors of the process, the method, the object or the device. Without more limitation, a factor defined in a sentence “include a...” does not exclude a case that there is also another same factor in the process, the method, the object or the device including the described factor.

5 **[0090]** The above description of the embodiments enables those skilled in the art to implement or use the present disclosure. Various modifications to these embodiments are apparent to those skilled in the art, and the general principle defined herein may be implemented in other embodiments without deviating from the spirit or scope of the present disclosure. Therefore, the present disclosure is not limited to these embodiments described
10 herein, but in accordance with the widest scope consistent with the principle and novel features disclosed herein.

CLAIMS

1. An early warning method for a roadheader remote monitoring system, comprising:

preconfiguring early warning strategies corresponding to respective parameters of a
5 roadheader, and preconfiguring combined parameter information and early warning
relationships among respective parameter in the combined parameter information;

determining early warning results of the respective parameters in the combined
parameter information according to the corresponding early warning strategies, during
system's real-time remote monitoring of the respective parameters of the roadheader, and

10 determining, according to the early warning results and the early warning relationships, a
combined early warning result corresponding to the combined parameter information, and
triggering a combined early warning when the combined early warning result meets a
combined early warning trigger condition.

15 2. The early warning method for a roadheader remote monitoring system according to
claim 1, wherein the preconfiguring early warning strategies corresponding to respective
parameters of a roadheader comprises:

preconfiguring standard determination strategies corresponding to the respective
parameters of the roadheader under different construction environments, and

20 when it is determined according to the standard determination strategies that the
roadheader has any substandard parameter, determining that the substandard parameter meets
its independent early warning trigger condition.

3. The early warning method for a roadheader remote monitoring system according to
25 claim 2, wherein the preconfiguring early warning strategies corresponding to respective
parameters of a roadheader comprises:

associating any one of the parameters of the roadheader with a working state
corresponding to the parameter, and

when it is determined, according to both the standard determination strategy and the

working state that correspond to the parameter, that the parameter is substandard, determining that the parameter meets its independent early warning trigger condition.

4. The early warning method for a roadheader remote monitoring system according to
5 any one of claims 2 to 3, comprising:

when any one of the parameters of the roadheader meets its independent early warning trigger condition, triggering the independent early warning corresponding to the parameter.

5. The early warning method for a roadheader remote monitoring system according to
10 claim 4, comprising:

pre-classifying the independent early warnings corresponding to the respective parameters of the roadheader according to parameter functions, to obtain a plurality of early warning types;

pre-determining responsible personnel for each of the early warning types, and assigning
15 roles and role-levels to the responsible personnel;

when an independent early warning is triggered, sending a corresponding early warning message by a short message platform to upper-level responsible personnel, so that the upper-level responsible personnel forwards the early warning message level by level to lower-level responsible personnel.

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6. The early warning method for a roadheader remote monitoring system according to claim 5, comprising:

when the combined early warning is triggered, sending a corresponding early warning message by the short message platform to management personnel who triggers the combined
25 early warning.

7. The early warning method for a roadheader remote monitoring system according to claim 5, comprising:

recording the responsible personnel who receives the early warning message and the time of the receipt, and generating an early warning transfer timeline.

8. The early warning method for a roadheader remote monitoring system according to
5 claim 7, comprising:

cancelling the early warning if the relevant parameter of the roadheader is adjusted by relevant responsible personnel, after the early warning is triggered.

9. The early warning method for a roadheader remote monitoring system according to
10 claim 8, wherein the early warning relationship between two parameters in the combined parameter information is AND or OR.

10. An early warning system for a roadheader remote monitoring system, comprising:

an preconfiguring module, configured to preconfigure early warning strategies
15 corresponding to respective parameters of a roadheader, and preconfigure combined parameter information and early warning relationships among respective parameters in the combined parameter information;

an early warning determining module, configured to determine early warning results of the respective parameters in the combined parameter information according to the
20 corresponding early warning strategies, during system's real-time remote monitoring of the respective parameters of the roadheader; and

an combined early warning module, configured to determine, according to the early warning results and the early warning relationships, a combined early warning result corresponding to the combined parameter information, and triggering a combined early
25 warning when the combined early warning result meets a combined early warning trigger condition.