METHODS AND APPARATUS TO MONITOR AND MANAGE LOADING DOCK OPERATIONS

FIELD OF THE DISCLOSURE

[0001] This disclosure relates generally to loading docks, and, more particularly, to methods and apparatus to monitor and manage loading dock operations.

BACKGROUND

[0002] Loading docks provide an area for vehicles (e.g., trucks, trailers, etc.) to move next to an elevated platform of a building (e.g., a material handling facility) so that cargo can be readily transferred between the vehicle and the building. Some loading docks include equipment such as dock levelers, vehicle restraints, and/or dock doors, any of which may be associated with one or more sensor/monitoring systems.

SUMMARY

[0002a] According to a first aspect of the present disclosure, there is provided an apparatus including: a sensor feedback analyzer to analyze feedback from sensors associated with a dock at a material handling facility to determine multiple durations for completion of multiple corresponding tasks in a sequence of operations associated with at least one of loading or unloading of a trailer at the dock based on the feedback, the tasks in the sequence of operations including (i) positioning the trailer at the dock, (ii) activating a vehicle restraint to secure the trailer at the docket, (iii) opening a door at the dock, and (iv) activating a dock leveler to span a gap between the trailer and a platform of the dock; an efficiency analyzer to compare the durations to target thresholds associated with the tasks; and a user interface generator to generate a user interface indicating at least one of the durations, the target thresholds, or differences between the durations and the target thresholds.

[0002b] According to a second aspect of the present disclosure, there is provided a computer readable medium including instructions that, when executed, cause a machine to at least: analyze feedback from sensors associated with a dock at a material handling facility to determine multiple durations for completion of multiple corresponding tasks in a sequence of operations associated with at least one of loading or unloading of a trailer at the dock based on the feedback, the tasks in the sequence of operations including (i) moving a dock leveler

to a stored position spaced apart from the trailer, (ii) closing a door at the dock, (iii) de-activating a vehicle restraint to release the trailer, and (iv) moving the trailer away from the dock; compare the durations to target thresholds associated with the tasks; and generate a user interface indicating at least one of the durations, the target thresholds, or differences between the durations and the target thresholds.

[0002c] According to a third aspect of the present disclosure, there is provided a method including: analyzing feedback from sensors associated with a dock at a material handling facility to determine multiple durations for completion of multiple corresponding tasks in a sequence of operations associated with at least one of loading or unloading of a trailer at the dock based on the feedback, the tasks in the sequence of operations including (i) positioning the trailer at the dock, (ii) activating a vehicle restraint to secure the trailer at the docket, (iii) opening a at the dock, and (iv) activating a dock leveler to span a gap between the trailer and a platform of the dock; comparing the durations to target thresholds associated with the tasks; and generating a user interface indicating at least one of the durations, the target thresholds, or differences between the durations and the target thresholds.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] FIG. 1 illustrates an example material handling facility in which teachings disclosed herein may be implemented.

[0004] FIG. 2 illustrates the example loading dock of FIG. 1 viewed from an exterior of the material handling facility.

[0005] FIG. 3 illustrates the example loading dock of FIG. 1 viewed from an interior of the material handling facility with a trailer parked at the dock.

[0006] FIG. 4 illustrates a cross-sectional side view of the example loading dock of FIG. 1 with the associated trailer of FIG. 3.

[0007] FIGS. 5-12 illustrate example user interfaces that may be provided via the local status indicator of FIG. 3 as successive tasks in the sequence of operations associated with the loading and/or unloading of a trailer at a particular dock are completed.

[0008] FIG. 13 is a block diagram of an example implementation of the example controller of FIG. 1.

[0009] FIG. 14 is a block diagram of an example implementation of the example main server of FIG. 1.

[0010] FIGS. 15-23 illustrate example graphical user interfaces that may be generated by the main server of FIGS. 1 and/or 14.

CLAIMS

1. An apparatus comprising:

a sensor feedback analyzer to analyze feedback from sensors associated with a dock at a material handling facility to determine multiple durations for completion of multiple corresponding tasks in a sequence of operations associated with at least one of loading or unloading of a trailer at the dock based on the feedback, the tasks in the sequence of operations including (i) positioning the trailer at the dock, (ii) activating a vehicle restraint to secure the trailer at the docket, (iii) opening a door at the dock, and (iv) activating a dock leveler to span a gap between the trailer and a platform of the dock;

an efficiency analyzer to compare the durations to target thresholds associated with the tasks; and

a user interface generator to generate a user interface indicating at least one of the durations, the target thresholds, or differences between the durations and the target thresholds.

2. The apparatus of claim 1, wherein the user interface generator is to generate a timeline indicating when successive ones of the tasks were completed relative to previous ones of the tasks.

3. The apparatus of claim 2, wherein the at least one of the loading or unloading of the trailer includes an arrival phase, a material handling phase, and a departure phase, the timeline extends in a first direction during the arrival phase, a second direction during the material handling phase, and a third direction during the departure phase, the first direction is different than the second direction, and the second direction is different than the third direction.

4. The apparatus of claim 2, wherein the timeline is a first timeline, the user interface generator to generate a second timeline based on the target thresholds for the tasks.

5. The apparatus of claim 1, further including:

memory to store the durations for the completion of the tasks; and

a target threshold determiner to update the target thresholds based on the stored durations.

6. The apparatus of claim 1, further including:

a utilization analyzer to determine utilization metrics for different docks at the material handling facility; and

a dock assignment analyzer to assign a new trailer to one of the different docks based on the utilization metrics.

7. The apparatus of claim 6, wherein the user interface generator is to generate a utilization heat map for the different docks based on the utilization metrics.

8. The apparatus of claim 1, wherein the user interface generator is to generate a timing indicator to provide an indication of time relative to a first one of the target thresholds while a first one of the tasks is being completed.

9. The apparatus of claim 8, wherein the timing indicator counts up to indicate an amount of elapsed time since at least one of a beginning of the first task or the completion of a task previous to the first task.

10. The apparatus of claim 8, wherein the timing indicator counts down from a time corresponding to the first target threshold to indicate an amount of time remaining to complete the first task within the first target threshold.

11. A computer readable medium comprising instructions that, when executed, cause a machine to at least:

analyze feedback from sensors associated with a dock at a material handling facility to determine multiple durations for completion of multiple corresponding tasks in a sequence of operations associated with at least one of loading or unloading of a trailer at the dock based on the feedback, the tasks in the sequence of operations including (i) moving a dock leveler to a stored position spaced apart from the trailer, (ii) closing a door at the dock, (iii) de-activating a vehicle restraint to release the trailer, and (iv) moving the trailer away from the dock;

compare the durations to target thresholds associated with the tasks; and

generate a user interface indicating at least one of the durations, the target thresholds, or differences between the durations and the target thresholds.

12. The computer readable medium of claim 11, wherein the instructions further cause the machine to generate a timeline indicating when successive ones of the tasks were completed relative to previous ones of the tasks.

13. The computer readable medium of claim 12, wherein the at least one of the loading or unloading of the trailer includes an arrival phase, a material handling phase, and a departure phase, the timeline extends in a first direction during the arrival phase, a second direction during the material handling phase, and a third direction during the departure phase, the first direction is different than the second direction, and the second direction is different than the third direction.

14. The computer readable medium of claim 12, wherein the timeline is a first timeline, the instructions further causing the machine to generate a second timeline based on the target thresholds for the tasks.

15. The computer readable medium of claim 11, wherein the instructions further cause the machine to:

store the durations for the completion of the tasks; and

update the target thresholds based on the stored durations.

16. The computer readable medium of claim 11, wherein the instructions further cause the machine to:

determine utilization metrics for different docks at the material handling facility; and

assign a new trailer to one of the different docks based on the utilization metrics.

17. The computer readable medium of claim 16, wherein the instructions further cause the machine to generate a utilization heat map for the different docks based on the utilization metrics.

18. The computer readable medium of claim 11, wherein the instructions further cause the machine to generate a timing indicator to provide an indication of time relative to a first one of the target thresholds while a first one of the tasks is being completed.

19. The computer readable medium of claim 18, wherein the timing indicator counts up to indicate an amount of elapsed time since at least one of a beginning of the first task or the completion of a task previous to the first task.

20. The computer readable medium of claim 18, wherein the timing indicator counts down from a time corresponding to the first target threshold to indicate an amount of time remaining to complete the first task within the first target threshold.

21. A method comprising:

analyzing feedback from sensors associated with a dock at a material handling facility to determine multiple durations for completion of multiple corresponding tasks in a sequence of operations associated with at least one of loading or unloading of a trailer at the dock based on the feedback, the tasks in the sequence of operations including (i) positioning the trailer at the dock, (ii) activating a vehicle restraint to secure the trailer at the docket, (iii) opening a at the dock, and (iv) activating a dock leveler to span a gap between the trailer and a platform of the dock;

comparing the durations to target thresholds associated with the tasks; and

generating a user interface indicating at least one of the durations, the target thresholds, or differences between the durations and the target thresholds.

22. The method of claim 21, further including generating a timeline indicating when successive ones of the tasks were completed relative to previous ones of the tasks.

23. The method of claim 22, wherein the at least one of the loading or unloading of the trailer includes an arrival phase, a material handling phase, and a departure phase, the timeline extends in a first direction during the arrival phase, a second direction during the material handling phase, and a third direction during the departure phase, the first direction is different than the second direction, and the second direction is different than the third direction.

24. The method of claim 22, wherein the timeline is a first timeline, the method further including generating a second timeline based on the target thresholds for the tasks.

25. The method of claim 21, further including:

storing the durations for the completion of the tasks; and

updating the target thresholds based on the stored durations.

26. The method of claim 21, further including:

determining utilization metrics for different docks at the material handling facility; and

assigning a new trailer to one of the different docks based on the utilization metrics.

27. The method of claim 26, further including generating a utilization heat map for the different docks based on the utilization metrics.

28. The method of claim 21, further including generating a timing indicator to provide an indication of time relative to a first one of the target thresholds while a first one of the tasks is being completed.

29. The method of claim 28, wherein the timing indicator counts up to indicate an amount of elapsed time since at least one of a beginning of the first task or the completion of a task previous to the first task.

30. The method of claim 28, wherein the timing indicator counts down from a time corresponding to the first target threshold to indicate an amount of time remaining to complete the first task within the first target threshold.