We claim:

1. A method of limiting energy consumption in a facility having at least one tintable window between an interior and exterior of the facility, wherein the level of tinting in the tintable window can be controlled automatically, the method comprising:

(a) receiving output signals from any two or more sensors selected from the group consisting of an exterior photosensor, an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior;

(b) determining a level of tint for said tintable window using a relationship between the received output signals and the level of tint; and

(c) providing instructions to change the tint of the tintable window to the level of tint determined in (b).

2. The method of claim 1, further comprising applying voltage or current to the tintable window to drive the change in tint pursuant to the instructions provided in (c).

3. The method of claim 1 or 2, wherein the relationship used in (b) reduces energy consumption caused by a heating system, a cooling system, and/or lighting in the facility than otherwise would be caused, while providing conditions suitable for occupancy of the facility.

4. The method of any of the foregoing claims, further comprising receiving an energy or power consumption signal indicating energy or power consumption by a heating system, a cooling system, and/or lighting in the facility, and using said energy or power consumption signal together with the received output signals in (a) to determine the level of tinting for said tintable window.

5. The method of any of the foregoing claims, wherein determining the level of tint in (b) comprises using scheduling information for the facility.

6. The method of claim 5, wherein the scheduling information comprises time of year and/or time of day information for the facility.

7. The method of claim 6, wherein the scheduling information further comprises information about the geographical facing direction of the tintable window, a time of day, and a latitude and a longitude of the facility.

8. The method of any of the foregoing claims, wherein the relationship employed in (b) is an expression in which the level of tint is the dependent variable and the output signals are independent variables.

9. The method of any of the foregoing claims, wherein the relationship employed in (b) is a lookup table in which levels of tint are specified for various combinations of output signal values.

10. The method of any of the foregoing claims, wherein the relationship employed in (b) specifies the level of tint for said tintable window based, in part, on whether the window is transitioning from a darker tint to a lighter tint or from a lighter tint to a darker tint.

11. The method of any of the foregoing claims, wherein the output signals comprise the output signal from an exterior photosensor, and wherein the relationship employed in (b) requires (i) transitioning from a first lighter tint level to a second darker tint level when the output signal from the exterior photosensor passes a first threshold and (ii) transitioning from the second darker tint level to the first lighter tint level when the output signal from the exterior photosensor passes a second threshold, and wherein the first and second thresholds are different.

12. The method of claim 11, wherein the first threshold is reached at a first value of irradiance and the second threshold is reached at a second value of irradiance, and the first value is greater than the second value.

13. The method of any of the foregoing claims, wherein the output signals comprise a signal from the exterior photosensor and a signal from the interior photosensor, and wherein the relationship employed in (b) is an expression or look up table in which the level of tint is the dependent variable and the signals from the exterior photosensor and the interior photosensor are independent variables.

14. The method of claim 13, wherein the relationship employed in (b) uses scheduling information comprising time of year and/or time of day information for the facility.

15. The method of claim 13, wherein the output signals further comprise a signal from the occupancy sensor, and wherein the relationship employed in (b) further employs the signal from the occupancy sensor.

16. The method of claim 15, wherein the relationship employed in (b) further employs an energy or power consumption signal indicating energy or power consumption by a heating system, a cooling system, and/or lighting in the facility.

17. The method of claim 16, wherein the level of tint determined in (b) reduces energy consumption by a heating system, a cooling system, and/or lighting in the facility while providing conditions suitable for occupancy of the facility.

18. A controller for a tintable window for a facility having at least one tintable window between an interior and exterior of the facility, the controller comprising:

(a) a processor or control circuit;

(b) at least one input for receiving output signals from one or more sensors;

(c) instructions for causing the processor or control circuit to determine a level of tint in said tintable window by using a relationship between the received output signals and the level of tint, wherein the relationship employs output signals from any two or more sensors selected from the group consisting of an exterior photosensor, an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior; and

(d) at least one output for controlling, directly or indirectly, the level of tint in the tintable window.

19. The controller of claim 18, further comprising a power supply for applying voltage or current to the tintable window to drive the change in tint to reach the level of tint determined by the instructions.

20. The controller of claim 18 or 19, further comprising logic for receiving one or

more of the output signals from a building management system, a lighting control panel, or a security system for the facility.

21. The controller of any one of claims 18-20, further comprising logic for extracting one or more of the output signals from information provided by a building management system, a lighting control panel, or a security system for the facility.

22. The controller of any one of claims 18-21, further comprising a network interface for communicating with a network containing a building management system for the facility, a lighting control panel for the facility, and/or a security system for the facility.

23. The controller of any one of claims 18-22, further comprising logic for receiving an energy or power consumption signal indicating energy or power consumption by a heating system, a cooling system, and/or lighting in the facility.

24. The controller of claim 23, wherein the instructions further comprise instructions for using said energy or power consumption signal together with the received output signals in determining the level of tinting for said tintable window.

25. A system for controlling energy consumption in a facility that contains a tintable window between an interior and exterior of the facility, the system comprising:

(a) a building management system;

(b) a lighting control panel;

(c) a network over which the building management system and the lighting control panel communicate; and

(d) a controller for the tintable window, the controller comprising (i) instructions for determining a level of tint in said tintable window by using a relationship between received output signals and the level of tint, wherein the relationship employs output signals from any two or more sensors selected from the group consisting of an exterior photosensor, an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior, and (ii) at least one output for controlling, directly or indirectly, the level of tint in the tintable window.

26. The system of claim 25, wherein the lighting control panel provides occupancy information derived from the occupancy sensor, and wherein the relationship between received output signals and the level of tint employs the occupancy information from the lighting control panel.

27. A method of minimizing energy consumption in a facility having a tintable window between an exterior and an interior of the facility, wherein the tintable window has an adjustable level of tint controllable from a controller, the method comprising:

(a) receiving a signal indicating energy or power consumption by a heating system, a cooling system, and/or lighting within the facility;

(b) determining a level of tint for the tintable window using the signal indicating energy or power consumption of a device or system within the facility; and

(c) providing instructions to set the level of tint in the tintable window to the level determined in (b).

28. The method of claim 27, further comprising monitoring the energy or power consumption of said heating system, said cooling system, and/or said lighting of the facility to provide the signal indicating energy or power consumption.

29. The method of claim 27 or 28, wherein the device or system within the facility comprises a light, a group of lights, or a lighting system within the facility.

30. The method of claim 29, wherein the device or system with the facility comprises at least one light located within about 20 feet of the tintable window.

31. The method of any one of claims 27-30, wherein the device or system within the facility comprises a heating or cooling device or system in the facility.

32. The method of claim 31, wherein the device or system within the facility comprises at least one heating or cooling device located within about 50 feet of the tintable window.

33. A controller for a tintable window for a facility having at least one tintable window between an interior and exterior of the facility, the controller comprising:

(a) a processor or control circuit;

(b) at least one input for receiving output signals from one or more sensors;

(c) instructions for causing the processor or control circuit to determine a level of tint in said tintable window by using a relationship between the received output signals and the level of tint, wherein the relationship employs output signals from an exterior photosensor, an interior photosensor, an outside temperature sensor, and a tint command; and

(d) at least one output for controlling, directly or indirectly, the level of tint in the tintable window.

34. The controller of claim 33, further comprising a power supply for applying voltage or current to the tintable window to drive the change in tint to reach the level of tint determined by the instructions.

35. The controller of claim 33 or 34, further comprising logic for receiving the output signals from the one or more sensors.

36. The controller of any one of claims 33-35, wherein the tint command indicates a level of tint for the tintable window input by a person in the facility.

37. A method of limiting energy consumption in a facility having at least one tintable window between an interior and exterior of the facility, wherein the level of tinting in the tintable window can be controlled automatically, the method comprising:

(a) receiving signals indicating a level of exterior irradiance received at or proximate the tintable window;

(b) determining a level of tint for said tintable window using a relationship between the received output signals and the level of tint, wherein the relationship requires (i) transitioning from a first lighter tint level to a second darker tint level when the received level of irradiance passes a first threshold and (ii) transitioning from the second darker tint level to the first lighter tint level when the received level of irradiance passes a second threshold, and wherein the first and second thresholds are different; and

(c) providing instructions to change the tint of the tintable window to the level of tint determined in (b).

38. The method of claim 37, wherein the first threshold is reached at a first value of irradiance and the second threshold is reached at a second value of irradiance, and the first value is greater than the second value.

39. The method of claim 37 or 38, further comprising:

after a preset time elapses, repeating operations (a)-(c).

40. The method of claim 37 or 38, further comprising:

after a preset time elapses, repeating operation (a), and

when there is a change in the received signals indicating the level of exterior irradiance received at or proximate to the tintable window, repeating operations (b) and (c).

Claims

1. A method of limiting energy consumption in a facility having at least one tintable window between an interior and exterior of the facility, wherein the level of tinting in the tintable window can be controlled automatically, the method comprising:

(a) receiving output signals from any two or more sensors selected from the group consisting of an exterior photosensor, an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior;

(b) determining a level of tint for said tintable window using a relationship between the received output signals and the level of tint; and

(c) providing instructions to change the tint of the tintable window to the level of tint determined in (b),

wherein determining the level of tint in (b) comprises using scheduling information for the facility, and wherein the relationship employed in (b) is an expression in which the level of tint is the dependent variable and the output signals are the independent variables or a lookup table in which levels of tint are specified for various combinations of output signal values.

2. The method of claim 1, further comprising applying voltage or current to the tintable window to drive the change in tint pursuant to the instructions provided in (c).

3. The method of claim 1, wherein the relationship used in (b) reduces energy consumption caused by a heating system, a cooling system, and/or lighting in the facility than otherwise would be caused, while providing conditions suitable for occupancy of the facility.

4. The method of claim 1, further comprising receiving an energy or power consumption signal indicating energy or power consumption by a heating system, a cooling system, and/or lighting in the facility, and using said energy or power consumption signal together with the received output signals in (a) to determine the level of tinting for said tintable window.

5. The method of claim 1, wherein the scheduling information comprises time of year and/or

time of day information for the facility.

6. The method of claim 5, wherein the scheduling information further comprises information about the geographical facing direction of the tintable window, a time of day, and a latitude and a longitude of the facility.

7. The method of claim 1, wherein the relationship employed in (b) specifies the level of tint for said tintable window based, in part, on whether the window is transitioning from a darker tint to a lighter tint or from a lighter tint to a darker tint.

8. The method of claim 1, wherein the output signals comprise the output signal from an exterior photosensor, and wherein the relationship employed in (b) requires (i) transitioning from a first lighter tint level to a second darker tint level when the output signal from the exterior photosensor passes a first threshold and (ii) transitioning from the second darker tint level to the first lighter tint level when the output signal from the exterior photosensor passes a second threshold, and wherein the first and second thresholds are different.

9. A method of limiting energy consumption in a facility having at least one tintable window between an interior and exterior of the facility, wherein the level of tinting in the tintable window can be controlled automatically, the method comprising:

(a) receiving output signals from an exterior photosensor and any one or more sensors selected from the group consisting of an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior;

(b) determining a level of tint for said tintable window using a relationship between the received output signals and the level of tint; and

(c) providing instructions to change the tint of the tintable window to the level of tint determined in (b),

wherein the relationship employed in (b) requires (i) transitioning from a first lighter tint level to a second darker tint level when the output signal from the exterior photosensor passes a first threshold and (ii) transitioning from the second darker tint level to the first lighter tint level when the

output signal from the exterior photosensor passes a second threshold, and wherein the first and second thresholds are different, and

wherein the first threshold is reached at a first value of irradiance and the second threshold is reached at a second value of irradiance, and the first value is greater than the second value.

10. A method of limiting energy consumption in a facility having at least one tintable window between an interior and exterior of the facility, wherein the level of tinting in the tintable window can be controlled automatically, the method comprising:

(a) receiving output signals from any two or more sensors selected from the group consisting of an exterior photosensor, an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior;

(b) determining a level of tint for said tintable window using a relationship between the received output signals and the level of tint; and

(c) providing instructions to change the tint of the tintable window to the level of tint determined in (b),

wherein the output signals comprise a signal from the exterior photosensor and a signal from the interior photosensor, and wherein the relationship employed in (b) is an expression or look up table in which the level of tint is the dependent variable and the signals from the exterior photosensor and the interior photosensor are independent variables.

11. The method of claim 10, wherein the relationship employed in (b) uses scheduling information comprising time of year and/or time of day information for the facility.

12. The method of claim 10, wherein the output signals further comprise a signal from the occupancy sensor, and wherein the relationship employed in (b) further employs the signal from the occupancy sensor.

13. The method of claim 12, wherein the relationship employed in (b) further employs an energy or power consumption signal indicating energy or power consumption by a heating system, a cooling system, and/or lighting in the facility.

14. The method of claim 13, wherein the level of tint determined in (b) reduces energy consumption by a heating system, a cooling system, and/or lighting in the facility while providing conditions suitable for occupancy of the facility.

15. A controller for a tintable window for a facility having at least one tintable window between an interior and exterior of the facility, the controller comprising:

(a) a processor or control circuit;

(b) at least one input for receiving output signals from one or more sensors;

(c) instructions for causing the processor or control circuit to determine a level of tint in said tintable window by using a relationship between the received output signals and the level of tint, wherein the relationship employs output signals from any two or more sensors selected from the group consisting of an exterior photosensor, an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior;

(d) at least one output for controlling, directly or indirectly, the level of tint in the tintable window;

(e) logic for receiving one or more of the output signals from a building management system, a lighting control panel, or a security system for the facility, and further comprising logic for receiving an energy or power consumption by a heating system, a cooling system, and/or lighting in the facility.

16. The controller of claim 15, further comprising a power supply for applying voltage or current to the tintable window to drive the change in tint to reach the level of tint determined by the instructions.

17. The controller of claim 15, further comprising logic for extracting one or more of the output signals from information provided by a building management system, a lighting control panel, or a security system for the facility.

18. The controller of claim 15, further comprising a network interface for communicating with a

network containing a building management system for the facility, a lighting control panel for the facility, and/or a security system for the facility.

19. The controller of claim 15, wherein the instructions further comprise instructions for using said energy or power consumption signal together with the received output signals in determining the level of tinting for said tintable window.

20. A system for controlling energy consumption in a facility that contains a tintable window between an interior and exterior of the facility, the system comprising:

(a) a building management system;

(b) a lighting control panel;

(c) a network over which the building management system and the lighting control panel communicate;

(d) a controller for the tintable window, the controller comprising (i) instructions for determining a level of tint in said tintable window by using a relationship between received output signals and the level of tint, wherein the relationship employs output signals from any two or more sensors selected from the group consisting of an exterior photosensor, an interior photosensor, an occupancy sensor, an exterior temperature sensor, and a transmissivity sensor which detects light passing through the tintable window from the exterior, and (ii) at least one output for controlling, directly or indirectly, the level of tint in the tintable window; and wherein the lighting control panel provides occupancy information derived from the occupancy sensor, and wherein the relationship between received output signals and the level of tint employs the occupancy information from the lighting control panel.

21. A controller for a tintable window for a facility having at least one tintable window between an interior and exterior of the facility, the controller comprising:

(a) a processor or control circuit;

(b) at least one input for receiving output signals from one or more sensors;

(c) instructions for causing the processor or control circuit to determine a level of tint in said tintable window by using a relationship between the received output signals and the level of tint, wherein the relationship employs output signals from an exterior photosensor, an interior

photosensor, an outside temperature sensor, and a tint command;

(d) at least one output for controlling, directly or indirectly, the level of tint in the tintable window; and

(e) a network interface for communicating with a network containing a building management system for the facility, a lighting control panel for the facility, and/or a security system for the facility.

22. The controller of claim 21, further comprising a power supply for applying voltage or current to the tintable window to drive the change in tint to reach the level of tint determined by the instructions.

23. The controller of claim 21, further comprising logic for receiving the output signals from the one or more sensors.

24. The controller of claim 21, wherein the tint command indicates a level of tint for the tintable window input by a person in the facility.

25. The system of claim 20, wherein the controller further comprises a power supply for applying voltage or current to the tintable window to drive a change in tint to reach the level of tint determined by the instructions.

26. The system of claim 20, wherein the controller further comprises logic for receiving one or more of the output signals from the building management system, the lighting control panel, and/or a security system for the facility.

27. The system of claim 20, wherein the controller further comprises logic for extracting one or more of the output signals from information provided by the building management system, the lighting control panel, and/or the security system for the facility.

28. The system of claim 20, wherein the controller further comprises a network interface for communicating with the network.

29. The system of claim 20, wherein the controller further comprises logic for receiving an energy or power consumption signal indicating energy or power consumption by a heating system, a cooling system, and/or lighting in the facility.

30. The system of claim 29, wherein the controller further comprises instructions for using said energy or power consumption signal together with the received output signals in determining the level of tint for said tintable window.