affected adversely by a factor of 0.3 to 0.5, resulting in relatively higher distortion compared to non-dimmer controlled system.

Due to the demands for high powered LED lamps, for LED lamp systems comprising one or more high powered LED lamps, each LED lamp is typically controlled by a separate driver. High-powered LED lamps include, but are not limited to down lights; MR16; GU10; flood lamps etc. In such LED lamp systems, AC dimmers may be designed on the primary side, but will have to be in electrical communication with all LED drivers in the system. This is often complex and there will be greater distortion due to EMI may result as more and more high-powered LED lamps (and drivers) get added to the system.

~~It is an object of the~~ The invention seeks to at least alleviate one or more of the above problem(s).

SUMMARY OF THE INVENTION

Throughout this document, unless otherwise indicated to the contrary, the terms "comprising", "consisting of", and the like, are to be construed as non-exhaustive, or in other words, as meaning "including, but not limited to".

The present invention is related to the device that integrates the lighting dimming protocol interface such as PWM, 1-10V/0-10V Potentiometer and Motion Sensor control in a single dimmer device, called "Dimming Hub". Any user could connect the dimming devices to the Dimming Hub according to the dimming protocol used for lighting control purpose. The Dimming Hub provides more flexibility to users on the different protocols dimming devices selection for lighting control.

In accordance with a first aspect of the invention there is dimmer system comprising an input interface capable of receiving a dimming input from at least two dimming protocols; an input processer for determining the dimming protocol of the received dimming input and process the dimming input according to the dimming protocol; an output interface comprising a plurality of output ports, at least one output port adapted to transmit the processed dimming input (output of the input processor) to at least one LED driver; wherein ~~each of~~ the at least one LED driver is operable to drive

a plurality of high powered LED lamp units at a desired brightness in accordance with the ~~dimmer~~ processed dimming input.

Preferably, the input interface comprises at least two of the following:- motion control module; pulse wave modulation module; and potentiometer module.

Preferably, the output interface comprises a plurality of RJ45 Ethernet modular connectors.

Preferably, where the input interface comprises a motion control module, the motion control module comprises a timer for determining the duration the high-powered LED drivers are to remain at a desired brightness.

Preferably, the input processor comprises a pulse wave modulation (PWM) convertor and in operation, upon receiving a duty cycle to operate the PWM converter, the PWM signal is converted to an operating direct current (DC) voltage and sent to the output interface.

Preferably, the operating DC voltage after conversion is around 1.5 to 5 volts.

Preferably, the dimmer input comprises a pulse wave modulation (PWM) signal having a range of frequencies.

Preferably, the PWM signal frequencies at 100HZ to 2KHZ is determined as a normal PWM signal; and the PWM signal frequencies detected at 25Hz to 80Hz is determined as a motion sensor signal.

Preferably, the PWM signal frequencies at 100HZ to 2KHZ is determined as a normal PWM signal; and the PWM signal frequencies detected at 2.5KHz to 3KHz is determined as a motion sensor signal.

Preferably, any DC component within the PWM signal is disregarded by the input processor.

Preferably, the plurality of dimmer inputs comprises a potentiometer signal between 1 to 10 volts.

Preferably, any AC component within the potentiometer signal is disregarded by the input processor.

Preferably, an output port of the output interface is connected to another dimmer system.

In accordance with a second aspect of the invention there is ~~a LED driver comprising a dimmer system according to the previous aspect, wherein the LED driver comprises a non-isolated configuration and the dimmer system is implemented on a secondary end.~~ a lamp system comprising a dimmer system according to the previous aspect wherein the at least one output port is connected to the input interface of another dimmer system.

In accordance with a third aspect of the invention there is an electrical circuit ~~a LED driver~~ comprising a dimmer system according to ~~according to~~ the previous aspect, wherein ~~the LED driver comprises a isolated configuration and~~ the dimmer is implemented on a secondary end of the electrical circuit in a non-isolated configuration.

In accordance with a fourth aspect of the invention there is a method for processing and providing dimming signals to an electrical output comprising the steps of receiving dimming input from at least two dimming protocols; determining the dimming protocol of the received dimming inputs and processing the dimming input according to the dimming protocol; transmitting the processed dimming input to at least one LED driver for dimming; wherein ~~each of~~ the at least one LED driver is operable to drive a plurality of high powered LED lamp units at a desired brightness in accordance with the dimmer input.

BRIEF DESCRIPTION OF THE DRAWINGS

In the figures, which illustrate, by way of example only, embodiment(s) of the present invention, wherein

FIG. 1 is a schematic block diagram of the dimmer system in accordance with an embodiment of the invention;

FIG. 2 is a schematic block diagram of an example of the motion sensor circuitries.

FIG. 3 shows a possible circuit implementation of the dimmer system of Fig. 1;

FIG. 4 is a circuit diagram of an example of the integrated input interface in accordance with an embodiment of the invention;

CLAIMS

1. A dimmer system comprising

one input interface capable of receiving a dimming input from at least two dimming protocols; the dimming input in the form of either a pulse wave modulation (PWM) signal or a direct current (DC) voltage signal;

an input processer operable to receive the dimming input ~~signal~~ from the input interface and differentiate the received dimming protocol based on whether the received dimming input is a PWM signal or DC voltage signal, and process the dimming input according to the dimming protocol; and

an output interface comprising a plurality of output ports, at least one output port adapted to transmit the processed dimming input (output of the input processor) to at least one LED driver;

wherein ~~each of~~ the at least one LED driver is operable to drive a plurality of high powered LED lamp units at a desired brightness in accordance with the processed ~~dimmer~~ dimming input.

2. The dimmer system according to claim 1, wherein the at least two dimming protocols comprise at least two of the following:- Digital Addressable Lighting Interface (DALI); potentiometer control varying from 0-10 electrical volts; and motion sensing control protocol~~motion control module; pulse wave modulation module; and potentiometer module~~.

3. The dimmer system according to claim 1 or 2, wherein the ~~output interface~~plurality of output ports comprises a plurality of RJ45 Ethernet modular connectors.

4. The dimmer system according to claim 2, wherein where the dimming protocol is a motion ~~control module~~sensing control protocol, there ~~motion control module~~ comprises a timer ~~for~~ to ~~determining~~ determine ~~the~~ a duration the high-powered LED lamp units~~drivers~~ are to remain at a desired brightness.

5. The dimmer system according to claim 4, wherein the input processor comprises a main control unit operable to receive the dimming input ~~from the motion control module~~ and provide ~~an~~ the output in the form of a PWM signal with a duty cycle.

6. The dimmer system according to claim 5, wherein the input processor further comprise a PWM convertor and in operation, upon receiving the PWM signal with the duty cycle to operate the PWM converter, the PWM signal is converted to an operating DC voltage and sent to the output interface.

7. The dimmer system according to claim 6, wherein the operating DC voltage after conversion is around 1.5 to 5 volts.

8. The dimmer system according to any one of the preceding claims, wherein the input interface is adapted to receive dimming inputs from a PWM module, a potentiometer module, or a motion sensor interface.

9. The dimmer system according to claim 8, further comprises an input line for receiving dimming inputs from the PWM module, the potentiometer module and the motion sensor interface.

10. The dimmer system according to claim 9, wherein the dimming inputs received at the input line is sent to an input signal regulation unit.

11. The dimmer system according to claim 10, wherein the input signal regulation unit comprises a first input for the detection of PWM signal or motion sensor signal; and a second input for detection of potentiometer signal.

12. The dimmer system according to claim 11, wherein any DC signal received at the first input is disregarded and any AC signal received at the second input is disregarded.

~~8. The dimmer system according to claim 1, wherein the PWM signal has a range of frequencies.~~

913. The dimmer system according to any one of claims 810 to 12, wherein the PWM signal frequencies detected at a range between 100HzZ to 2KHzZ is determined as a normal PWM signal; and the PWM signal frequencies detected at a range between 25Hz to 80Hz is determined as a motion sensor signal.

~~10~~14. The dimmer system according to any one of claims 810 to 12, wherein the PWM signal frequencies detected at a range between 100HzZ to 2KHzZ is

determined as a normal PWM signal; and the PWM signal frequencies detected at a range between 2.5KHz to 3KHz is determined as a motion sensor signal.

~~11. The dimmer system according to claim 8, wherein any DC component within the PWM signal is disregarded by the input processor.~~

~~12. The dimmer system according to claim 1, wherein the plurality of dimmer inputs comprises a potentiometer signal between 1 to 10 volts.~~

~~13. The dimmer system according to claim 12, wherein any AC component within the potentiometer signal is disregarded by the input processor.~~

~~14~~15. A lamp system comprising the dimmer system of any one of the preceding claims wherein an ~~the at least one~~ output port of ~~the~~ output interface is connected to the input interface of another dimmer system.

~~15~~16. An ~~LED driver~~electrical circuit comprising a dimmer system according to any one of claims 1 to 13, wherein the ~~LED driver comprises a non-isolated configuration and the~~ dimmer system is implemented on a secondary end of the electrical circuit in a non-isolated configuration.

~~16~~17. An electrical circuit ~~LED driver~~ comprising a dimmer system according to any one of claims 1 to 13, wherein the ~~LED driver comprises a isolated configuration and the~~ dimmer system is implemented on a secondary end of the electrical circuit in an isolated configuration.

~~17~~18. A method for processing and providing dimming signals to an electrical output comprising the steps of: -

receiving one dimming input from at least two dimming protocols, the dimming input in the form of a pulse wave modulation (PWM) signal or a direct current (DC) voltage signal;

differentiating the dimming protocol of the received dimming input based on whether the received dimming input is a PWM signal or DC voltage signal and processing the dimming input according to the dimming protocol;

transmitting the processed dimming input to at least one LED driver for dimming;

wherein ~~each of~~ the at least one LED driver is operable to drive a plurality of high powered LED lamp units at a desired brightness in accordance with the dimmer input.

19. The method according to claim 18, wherein the at least two dimming protocols comprise at least two of the following:- Digital Addressable Lighting Interface (DALI); potentiometer control varying from 0-10 electrical volts; and motion sensing control protocol.

20. The method according to claim 16 or 19, wherein where the dimming protocol is a motion sensing control protocol, there comprises a timer to determine a duration the high-powered LED lamp units are to remain at a desired brightness.

affected adversely by a factor of 0.3 to 0.5, resulting in relatively higher distortion compared to non-dimmer controlled system.

Due to the demands for high powered LED lamps, for LED lamp systems comprising one or more high powered LED lamps, each LED lamp is typically controlled by a separate driver. High-powered LED lamps include, but are not limited to down lights; MR16; GU10; flood lamps etc. In such LED lamp systems, AC dimmers may be designed on the primary side, but will have to be in electrical communication with all LED drivers in the system. This is often complex and there will be greater distortion due to EMI may result as more and more high-powered LED lamps (and drivers) get added to the system.

The invention seeks to at least alleviate one or more of the above problem(s).

SUMMARY OF THE INVENTION

Throughout this document, unless otherwise indicated to the contrary, the terms "comprising", "consisting of", and the like, are to be construed as non-exhaustive, or in other words, as meaning "including, but not limited to".

The present invention is related to the device that integrates the lighting dimming protocol interface such as PWM, 1-10V/0-10V Potentiometer and Motion Sensor control in a single dimmer device, called "Dimming Hub". Any user could connect the dimming devices to the Dimming Hub according to the dimming protocol used for lighting control purpose. The Dimming Hub provides more flexibility to users on the different protocols dimming devices selection for lighting control.

In accordance with a first aspect of the invention there is dimmer system comprising an input interface capable of receiving a dimming input from at least two dimming protocols; an input processer for determining the dimming protocol of the received dimming input and process the dimming input according to the dimming protocol; an output interface comprising a plurality of output ports, at least one output port adapted to transmit the processed dimming input (output of the input processor) to at least one LED driver; wherein the at least one LED driver is operable to drive a

plurality of high powered LED lamp units at a desired brightness in accordance with the –processed dimming input.

Preferably, the input interface comprises at least two of the following:- motion control module; pulse wave modulation module; and potentiometer module.

Preferably, the output interface comprises a plurality of RJ45 Ethernet modular connectors.

Preferably, where the input interface comprises a motion control module, the motion control module comprises a timer for determining the duration the high-powered LED drivers are to remain at a desired brightness.

Preferably, the input processor comprises a pulse wave modulation (PWM) convertor and in operation, upon receiving a duty cycle to operate the PWM converter, the PWM signal is converted to an operating direct current (DC) voltage and sent to the output interface.

Preferably, the operating DC voltage after conversion is around 1.5 to 5 volts.

Preferably, the dimmer input comprises a pulse wave modulation (PWM) signal having a range of frequencies.

Preferably, the PWM signal frequencies at 100HZ to 2KHZ is determined as a normal PWM signal; and the PWM signal frequencies detected at 25Hz to 80Hz is determined as a motion sensor signal.

Preferably, the PWM signal frequencies at 100HZ to 2KHZ is determined as a normal PWM signal; and the PWM signal frequencies detected at 2.5KHz to 3KHz is determined as a motion sensor signal.

Preferably, any DC component within the PWM signal is disregarded by the input processor.

Preferably, the plurality of dimmer inputs comprises a potentiometer signal between 1 to 10 volts.

Preferably, any AC component within the potentiometer signal is disregarded by the input processor.

Preferably, an output port of the output interface is connected to another dimmer system.

In accordance with a second aspect of the invention there is - a lamp system comprising a dimmer system according to the previous aspect wherein the at least one output port is connected to the input interface of another dimmer system.

In accordance with a third aspect of the invention there is an electrical circuit comprising a dimmer system according to the previous aspect, wherein the dimmer is implemented on a secondary end of the electrical circuit in a non-isolated configuration.

In accordance with a fourth aspect of the invention there is a method for processing and providing dimming signals to an electrical output comprising the steps of receiving dimming input from at least two dimming protocols; determining the dimming protocol of the received dimming inputs and processing the dimming input according to the dimming protocol; transmitting the processed dimming input to at least one LED driver for dimming; wherein the at least one LED driver is operable to drive a plurality of high powered LED lamp units at a desired brightness in accordance with the dimmer input.

BRIEF DESCRIPTION OF THE DRAWINGS

In the figures, which illustrate, by way of example only, embodiment(s) of the present invention, wherein

FIG. 1 is a schematic block diagram of the dimmer system in accordance with an embodiment of the invention;

FIG. 2 is a schematic block diagram of an example of the motion sensor circuitries.

FIG. 3 shows a possible circuit implementation of the dimmer system of Fig. 1;

FIG. 4 is a circuit diagram of an example of the integrated input interface in accordance with an embodiment of the invention;

CLAIMS

1. A dimmer system comprising

   one input interface capable of receiving a dimming input from at least two dimming protocols; the dimming input in the form of either a pulse wave modulation (PWM) signal or a direct current (DC) voltage signal;

   an input processer operable to receive the dimming input from the input interface and differentiate the received dimming protocol based on whether the received dimming input is a PWM signal or DC voltage signal, and process the dimming input according to the dimming protocol; and

   an output interface comprising a plurality of output ports, at least one output port adapted to transmit the processed dimming input (output of the input processor) to at least one LED driver;

   wherein the at least one LED driver is operable to drive a plurality of high powered LED lamp units at a desired brightness in accordance with the processed dimming input.

2. The dimmer system according to claim 1, wherein the at least two dimming protocols comprise at least two of the following:- Digital Addressable Lighting Interface (DALI); potentiometer control varying from 0-10 electrical volts; and motion sensing control protocol.

3. The dimmer system according to claim 1 or 2, wherein the plurality of output ports comprises a plurality of RJ45 Ethernet modular connectors.

4. The dimmer system according to claim 2, wherein where the dimming protocol is a motion sensing control protocol, there comprises a timer to determine a duration the high-powered LED lamp units are to remain at a desired brightness.

5. The dimmer system according to claim 4, wherein the input processor comprises a main control unit operable to receive the dimming input and provide the output in the form of a PWM signal with a duty cycle.

6. The dimmer system according to claim 5, wherein the input processor further comprise a PWM convertor and in operation, upon receiving the PWM signal with the duty cycle to operate the PWM converter, the PWM signal is converted to an operating DC voltage and sent to the output interface.

7. The dimmer system according to claim 6, wherein the operating DC voltage after conversion is around 1.5 to 5 volts.

8. The dimmer system according to any one of the preceding claims, wherein the input interface is adapted to receive dimming inputs from a PWM module, a potentiometer module, or a motion sensor interface.

9. The dimmer system according to claim 8, further comprises an input line for receiving dimming inputs from the PWM module, the potentiometer module and the motion sensor interface.

10. The dimmer system according to claim 9, wherein the dimming inputs received at the input line is sent to an input signal regulation unit.

11. The dimmer system according to claim 10, wherein the input signal regulation unit comprises a first input for the detection of PWM signal or motion sensor signal; and a second input for detection of potentiometer signal.

12. The dimmer system according to claim 11, wherein any DC signal received at the first input is disregarded and any AC signal received at the second input is disregarded.

13. The dimmer system according to any one of claims 10 to 12, wherein the PWM signal frequencies detected at a range between 100Hz to 2KHz is determined as a normal PWM signal; and the PWM signal frequencies detected at a range between 25Hz to 80Hz is determined as a motion sensor signal.

14. The dimmer system according to any one of claims 10 to 12, wherein the PWM signal frequencies detected at a range between 100Hz to 2KHz is determined as a normal PWM signal; and the PWM signal frequencies detected at a range between 2.5KHz to 3KHz is determined as a motion sensor signal.

15. A lamp system comprising the dimmer system of any one of the preceding claims wherein the at least one output port is connected to the input interface of another dimmer system.

16. An electrical circuit comprising a dimmer system according to any one of claims 1 to 13, wherein the dimmer system is implemented on a secondary end of the electrical circuit in a non-isolated configuration.

17. An electrical circuit comprising a dimmer system according to any one of claims 1 to 13, wherein the dimmer system is implemented on a secondary end of the electrical circuit in an isolated configuration.

18. A method for processing and providing dimming signals to an electrical output comprising the steps of: -

receiving one dimming input from at least two dimming protocols, the dimming input in the form of a pulse wave modulation (PWM) signal or a direct current (DC) voltage signal;

differentiating the dimming protocol of the received dimming input based on whether the received dimming input is a PWM signal or DC voltage signal and processing the dimming input according to the dimming protocol;

transmitting the processed dimming input to at least one LED driver for dimming;

wherein the at least one LED driver is operable to drive a plurality of high powered LED lamp units at a desired brightness in accordance with the dimmer input.

19.The method according to claim 18, wherein the at least two dimming protocols comprise at least two of the following:- Digital Addressable Lighting Interface (DALI); potentiometer control varying from 0-10 electrical volts; and motion sensing control protocol.

20. The method according to claim 18 or 19, wherein where the dimming protocol is a motion sensing control protocol, there comprises a timer to determine a duration the high-powered LED lamp units are to remain at a desired brightness.