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MOTOR CONTROL FROM A VIRTUAL WORLD INTO REAL WORLD

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Abstract

In this paper, a data connection has been provided to control a real 3-phase induction motor by a control signal coming from the Second Life which is a three dimensional virtual world. A server has been created in an object by means of a script in the Second Life. A client has been created by a microcontroller and a wireless module in the Real Life. The client has been connected the server. A Logic data has been sent into the Real Life microcontroller when a button pressed in the Second Life using this data connection. A contactor coil has been energized or de-energized to control a real 3-phase induction motor as on/off by the logic data in the microcontroller. The result shows that Second Life can be utilized to manage controllable Real Life objects in industry, education.

Keywords: Control, induction motor, real world, virtual world, Second Life.

INTRODUCTION

Virtual environment are useful places where educators and students use for teaching and learning processes also in industries. Synchronous communication and social interaction motivate teacher and students in virtual environments (De Lucia, Francese, Passero, & Tortora, 2009). A bibliometric analysis of virtual and remote labs in education has been performed (Heradio et al., 2016). A virtual house and a virtual plant have been examined for education of control (Riera & Vigário, 2017). A virtual Lab has been implemented for teaching satellite navigation system (Mikhaylov & Chernov, 2012). Second Life (SL) is a virtual world in which avatars can be controlled by users in real world (Varvello, Ferrari, Biersack, & Diot, 2011). Interaction and space has been examined in SL (Berger, Jucker, & Locher, 2016). A tutoring system has been implemented in SL (Amante, Campo, & Martínez, 2012). SL based Virtual Engineering Sciences Learning Lab (VESLL) has been designed and implemented for engineering students to increase their skills (August et al., 2016).

A study has described a remote lab as SecondLab in which students can control a real microbot from Second Life but the complete architecture is complicated (García-Zubia et al., 2010). In a study, a virtual home automation system has been designed that can be synchronized in real life system and can control real devices from the SL and the architecture of the proposed system includes Second Life, SL Plugin, Home Services, X10 Controller and they increased level of complexity (Hossain, Rahman, & Saddik, 2011).

This paper overcomes the drawbacks mentioned above by setting up a server in a SL script. A data connection has been provided to control a real 3-phase induction motor by a control signal coming from the Second Life which is a three dimensional virtual world. A server has been created in an object by means of a script in the Second Life. A client has been created by a microcontroller and a wireless module in the Real Life. The client has been connected the server. A Logic data has been sent into the Real Life microcontroller when a button pressed in the Second Life using this data connection. A contactor coil has been energized or de-energized to control a real 3-phase induction motor as on/off by the logic data in the microcontroller.

METHOD

In RL side, a circuit has been implemented for requesting data from SL object by using a wireless module and sent into a microcontroller. One output of the microcontroller has been 0 or 1 logically in terms of the incoming data. Figure 1 shows the flow chart of the RL side.

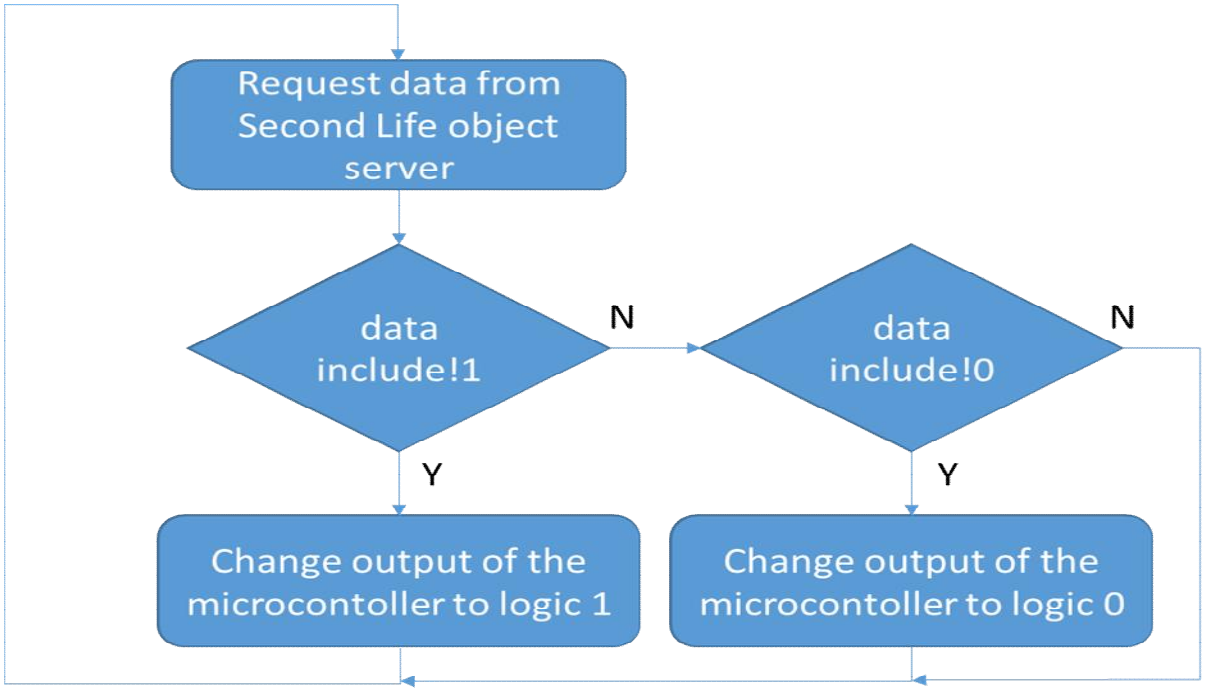

Figure 1: Flow chart of the RL side

In SL side, a virtual induction motor has been designed. The motor has been activated when an avatar clicks the motor and SL scripted server has been added !1 or !0 in terms of activation of the motor. Figure 2shows the flow chart of the SL side.

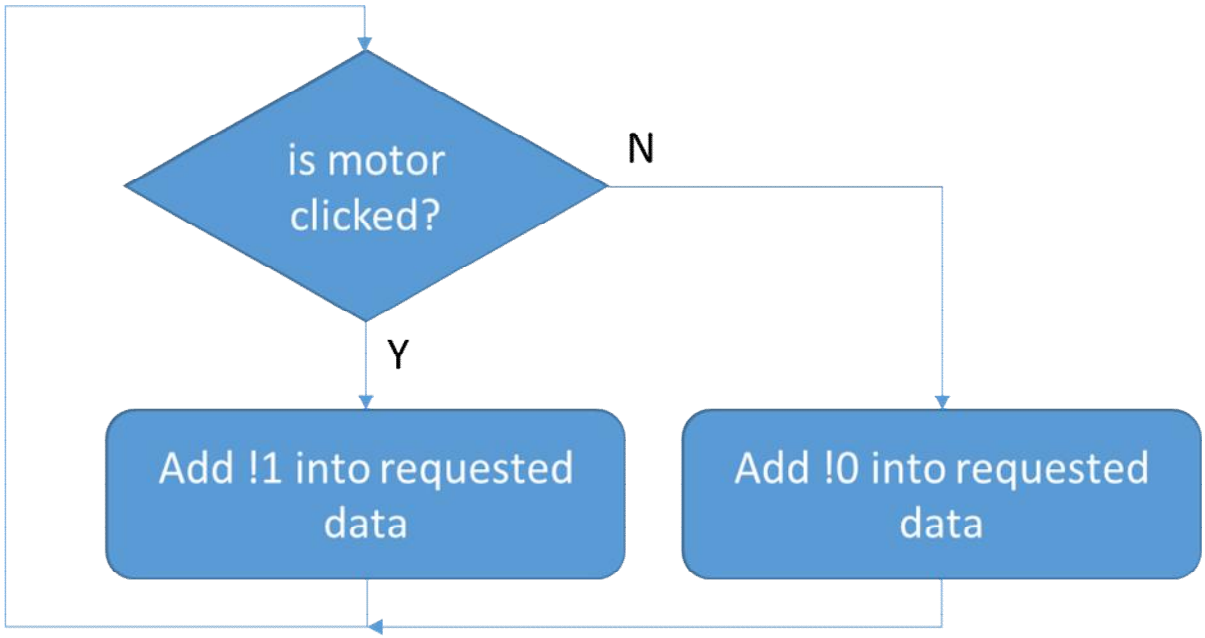

Figure 2: Flow chart of the SL side

FINDINGS

Figure 3 shows the designed motor in SL. The motor has been built using SL building system and scripted using Linden Script Language (LSL) to set up a SL script server by means of the llRequestURL and llHTTPResponse functions. The motor has been switched on/off when an avatar clicks on it using Touch event in SL.

Figure 3: The designed motor in SL

Figure 4 shows the bridge circuit connects RL and SL. This circuit includes voltage supply shown on the left side. A wireless module connects between the SL server page and an Arduino microcontroller. The components shown on left side drive a 12 V relay using the microcontroller output.

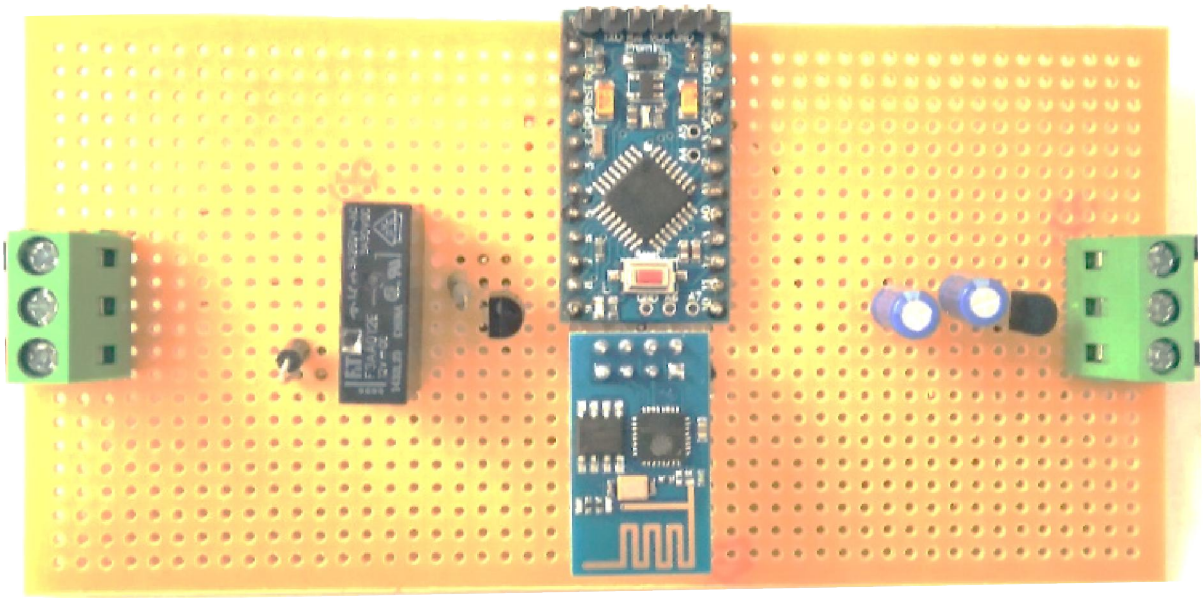

Figure 4: The bridge circuit connects RL and SL

Figure 5 shows the designed system in RL. The system includes the circuit, a contactor, a motor and power supplies. 12V voltage supply is for the relay and 3.3 V regulated by 12 V – 3.3 V converter for the wireless module ESP8266 and the microcontroller. The contactor is energized or de-energized using the relay and 220 V voltage supply. The "!1" data has been sent into the RL circuit as an avatar clicks on the virtual motor in SL. The microcontroller set its one output to logic 1 and then the relay switches on its normally open contact. 220 V energizes the contactor coil and switches on its normally open contacts. Three-phase power supply feeds the induction motor and the motor runs. The "!0" data has been sent into the RL circuit as an avatar clicks again on the virtual motor in SL. The microcontroller set the output to logic 0 and then the relay switches off and finally the motor stops.

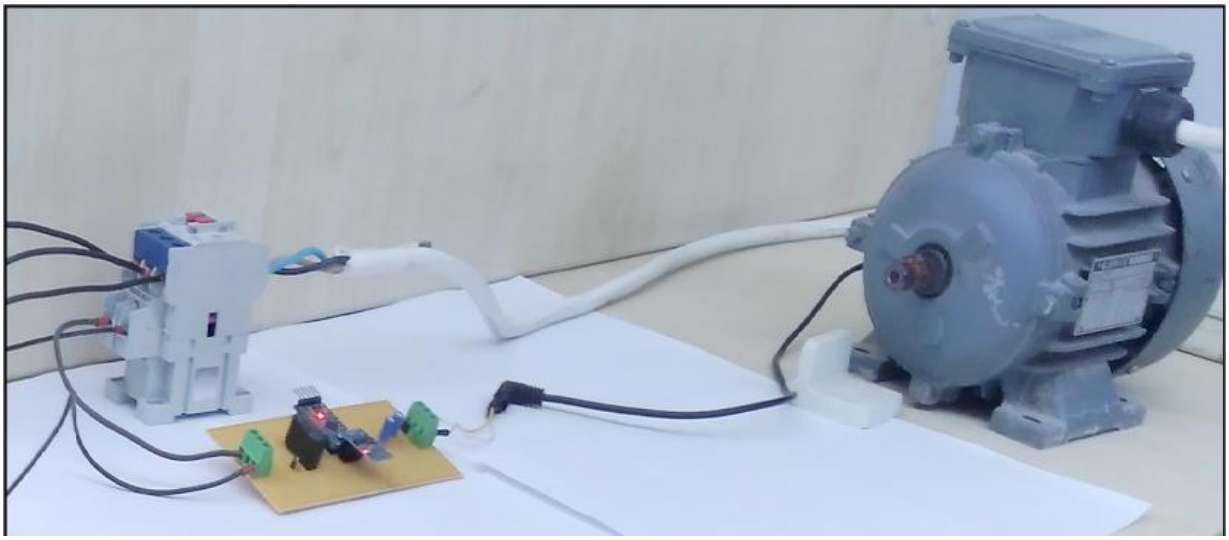

Figure 5: The designed system in RL

DISCUSSION AND CONCLUSION

A bridge between Real Life and Second Life has been designed and implemented by using SL scripts and real hardware. The bridge reduces the system complexity by using SL script server. But this server page can be easily vanished in some cases such as resetting scripts and/or restarting the region in SL. More information about the lifetime, resource and other limitations can be reached at (http://wiki.secondlife.com/wiki/LSL_HTTP_server). The result shows that Second Life can be utilized to manage controllable Real Life objects in industry, education.

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