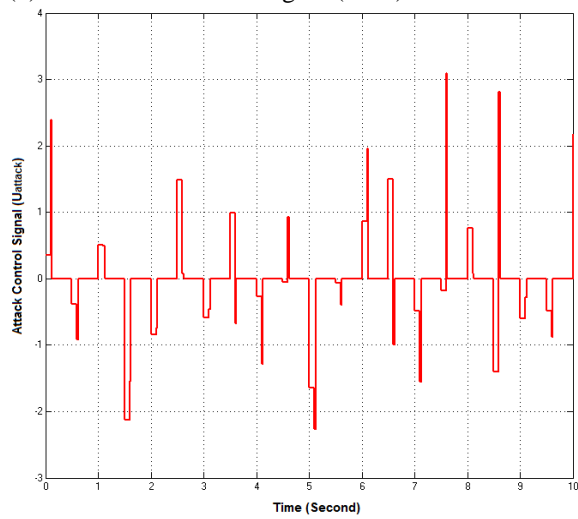
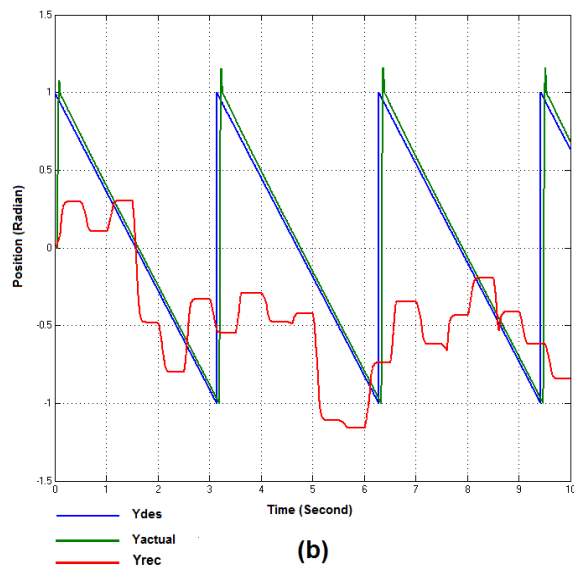


system without attacks (a) Actual system response
(b) The received sensor signal (Yrec)



(a)



(b)

Figure 12. Position control over the secure SCADA system with 25% attacks (a) Attack control signal (b) Actual response and the response to the attacker

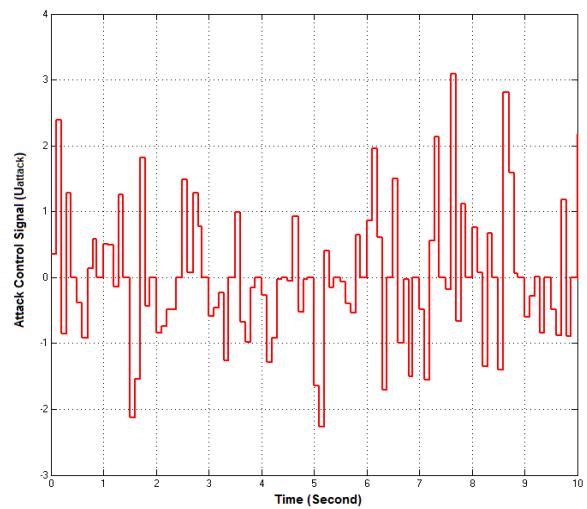
Actually, the security mechanism maintains the normal response of the position control system (green lines in Fig.12(b) and Fig.13(b)).

However, the sensor reading 'Yrec' (red lines in Fig.12(b) and Fig.13(b)) is follows what should be the remote plant response to the attacker signal 'Uattack'.

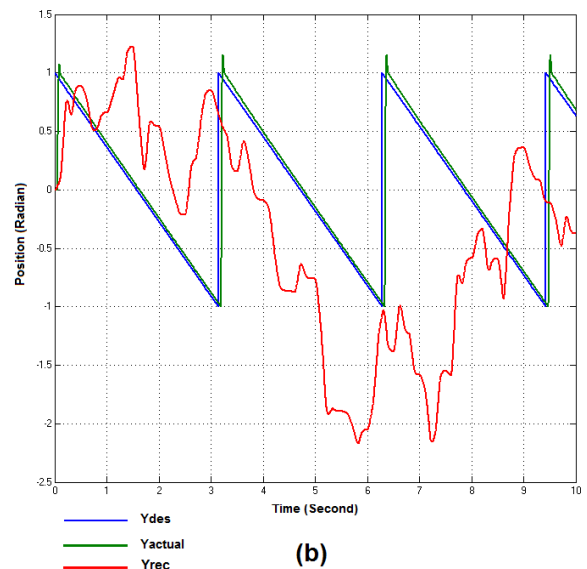
9. Conclusion

In this paper, to answer to cyber-attacks on SCAD systems, an attack-tolerant scheme is introduced. The proposed method is based on

deception of the cyber-attack when the current available data encryption method is broken.



(a)



(b)

Figure 13. Position control over the secure SCADA system with 75% attacks (a) Attack control signal (b) Actual response and the response to the attacker

In addition to the continuity of the control system work, the proposed technique makes the attacker to stop the development of the attack method, to send attack alarm to controller side. This information allows to give time for the authorized person to repair the broken part in the security mechanism.

In order to introduce the proposed technique, simple algorithm for sensor reading formation is described. This method can be extended to be more complex depending on the type of control system application. The investigation reveals that the proposed security mechanism can successfully be used for SCADA systems.

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