

XSICEL 2021

Transición energética en la 4ta revolución industrial



Universidad
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de Pereira



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Visualization Proposal for Power System Control Rooms Based on Situational Awareness

Authors:

MSc. Daniel Betancur
MSc. (c) Eros D. Escobar
MSc. Anderson Quintero
PhD. Jorge W. González
PhD. Gabriel J. López
PhD. Idi A. Isaac

Institution:

Universidad Pontificia Bolivariana
Grupo de Investigación en Transmisión y Distribución de Energía Eléctrica (T&D)

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I. Introduction

Why is it necessary to consider Situational Awareness (SA) in power systems?



- System information excess.
- Inclusion of new technologies.
- Classical schemes of visualization software.

II. SA Concept

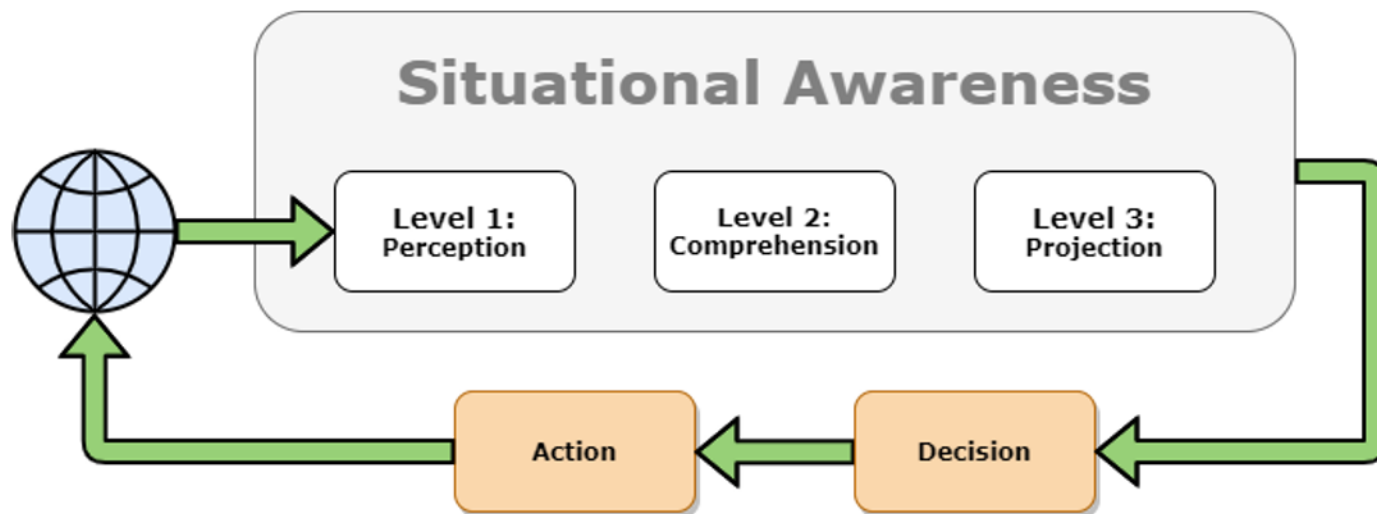
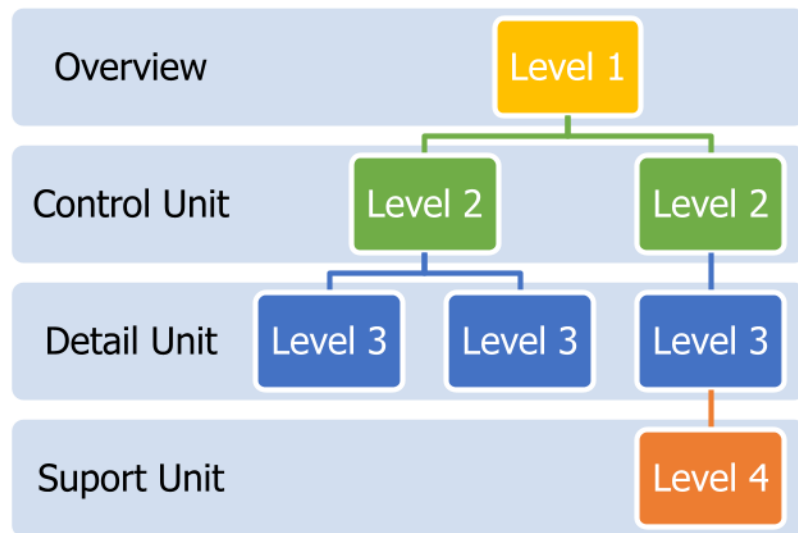


Figure adapted from: Endsley, M. R., & Connors, E. S. (2008). Situation awareness: State of the art. 2008 IEEE Power and Energy Society General Meeting - Conversion and Delivery of Electrical Energy in the 21st Century. doi:10.1109/pes.2008.4596937

III. Visualization interfaces based on SA

Levels



Colors

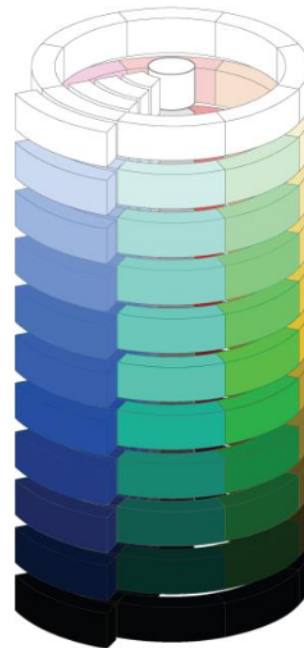


Figure taken from: J. Kennedy (2004), Principles of Information Visualization, Institute for Informatics & Digital Innovation, Edimburgo.

Appearance Attributes

Text

The quick brown fox
jumps over the lazy dog



The quick brown fox jumps over
the lazy dog



Grouping

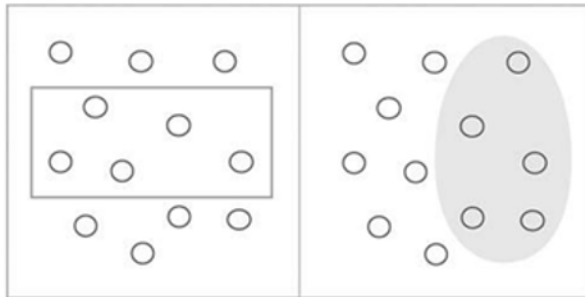


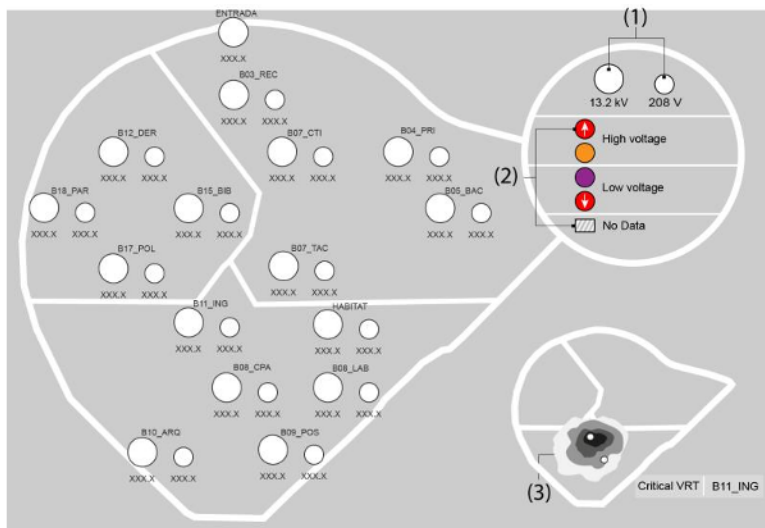
Figure taken from: S. Few, Information Dashboard Design, Sebastopol: O'Reilly Media, 2006.

Tables

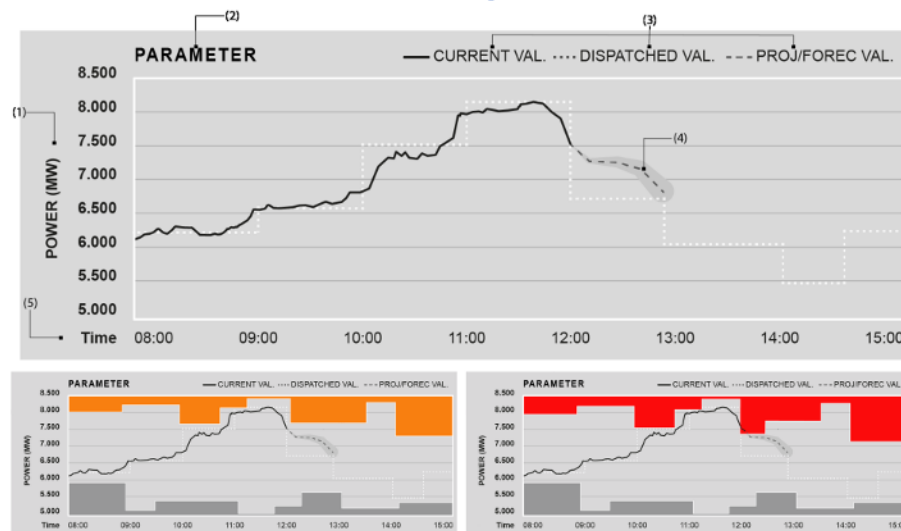
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e	2.718
c	299,792.458
D	6789.025
G	6.674

IV. SA for power systems visualization

Maps



Trend plots



List plot

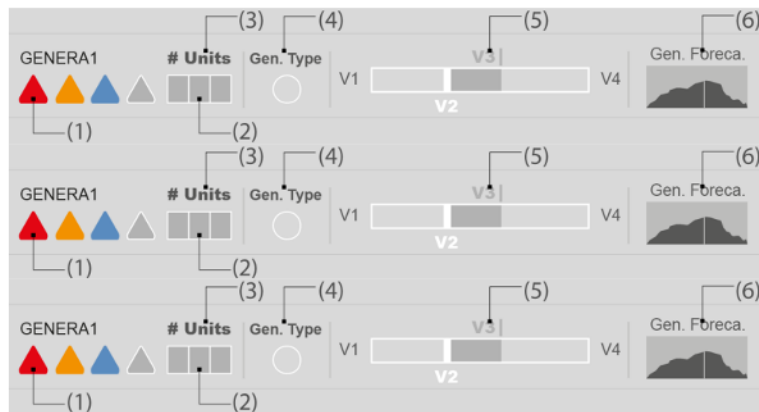
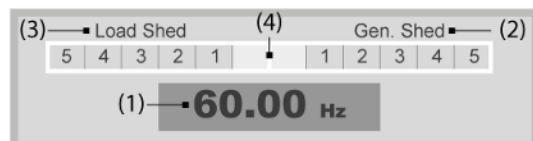


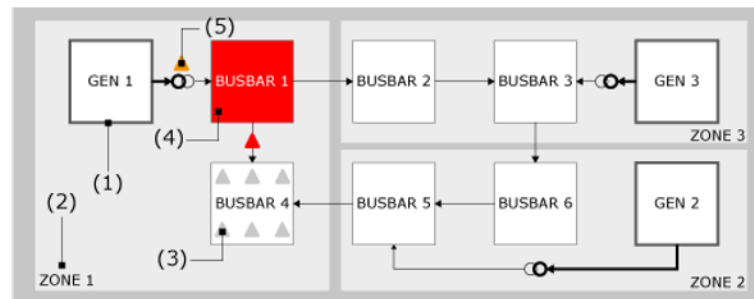
Table plot

RESERVE		P	Q	MW/min
		XXX MW	XXX MVAR	
RAMP		XXX MW	XXX MVAR	XXX
		XXX MW	XXX MVAR	

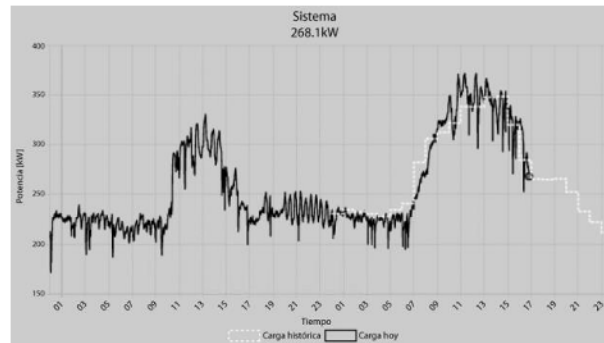
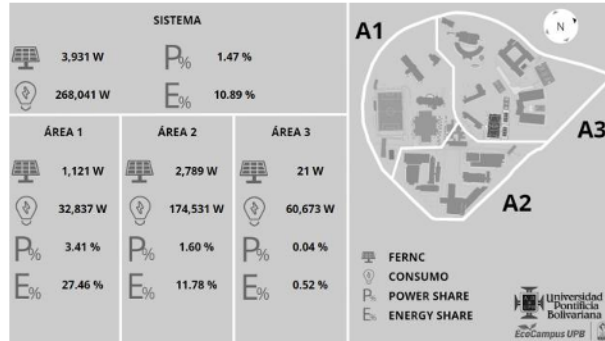
Bars plot



Hierarchy and grouping



V. Case Study: UPB Microgrid Control Room



VI. Discussion and Conclusions

- Quantifying the performance of operators in control rooms is a hard task. Work is being done to tackle this issue, derived from the designs proposed in this work.
- Several public grid operators and private electrical systems in Colombia integrate situational awareness concepts to their control rooms.
- Application cases, like the UPB microgrid supervision and control room interfaces, show a significant improvement in grid monitoring and data processing speed and efficacy.

VII. Questions