

# **Creating Healthy Spaces 2.0**

**Optimal residential comfort through smart, connected climate control** 

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Creating healthy spaces

VENTILATION | SUNPROTECTION | OUTDOOR

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OUTLINE



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OUTLINE



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# RENSON'S VISION: CREATING HEALTHY SPACES WITH SMART, CONNECTED SYSTEMS RENSON: A CENTURY OF INNOVATION IN CREATING HEALTHY SPACES

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#### **RENSON**<sup>®</sup> Creating healthy spaces



### RENSON'S VISION: CREATING HEALTHY SPACES WITH SMART, CONNECTED SYSTEMS FROM PRODUCTS TO SMART PRODUCTS

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# RENSON'S VISION: CREATING HEALTHY SPACES WITH SMART, CONNECTED SYSTEMS FROM SMART PRODUCTS TO SMART HOMES





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### RENSON'S VISION: CREATING HEALTHY SPACES WITH SMART, CONNECTED SYSTEMS FROM SMART HOMES TO SMART BUILDINGS





#### RENSON'S VISION: CREATING HEALTHY SPACES WITH SMART, CONNECTED SYSTEMS TOWARDS ONE SMART CONTROLLER

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OUTLINE





Comfort-energy balance



Simple configuration











Handle unknown situations



Include forecasts







# SMART CONTROL SYSTEMS: DIFFERENT APPROACHES AND TECHNIQUES RULE-BASED CONTROLLER: THE HOBBY COOK APPROACH







# SMART CONTROL SYSTEMS: DIFFERENT APPROACHES AND TECHNIQUES MODEL PREDICTIVE CONTROLLER (MPC): THE MASTER CHEF APPROACH





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Торіс	Rule-based controller	Model-based controller
Comfort-energy balance	-	++
Simple configuration	+	-
Scalable	-	+
Explainable	+	-
Optimal solution	_	++
Handle unknown situations	-	++
Include forecasts	-	++
Robust	-	+
Flexible	-	++
Self-learning	-	+



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# MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE RENSON CONCEPT HOME: A SHOWCASE OF MODEL PREDICTIVE CONTROL



Ventilation (HB3) Sunprotection Heatpump Monitoring (windows/doors, motion, climate)

AND

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### MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE SYSTEM MODEL FOR RENSON CONCEPT HOME





# MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE SYSTEM MODEL TYPES: PHYSICAL, DATA-DRIVEN, AND HYBRID





# MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE MODEL TEMPERATURE PREDICTIONS: HOW MPC ANTICIPATES THE FUTURE

#### White-box temperature prediction



**Grey-box temperature prediction** 



#### **Black-box temperature prediction**



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#### MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE RESULTS FROM MPC SHOWCASE



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#### MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE EXAMPLE: 2 RATHER SUNNY DAYS



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#### MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE EXAMPLE: 2 RATHER CLOUDY DAYS



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#### MODEL PREDICTIVE CONTROL: A SHOWCASE OF INNOVATION AND PERFORMANCE EXAMPLE: 2 SUNNY WEEKS



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OUTLINE



Conclusions and future work: Challenges and opportunities of MPC

CONCLUSIONS AND FUTURE WORK: CHALLENGES AND OPPORTUNITIES OF MPC THE NEXT STEPS FOR MPC DEVELOPMENT









More complex configurations

More complex objectives

User preferences

#### CONCLUSIONS AND FUTURE WORK: CHALLENGES AND OPPORTUNITIES OF MPC THE CHALLENGES OF EASY CONFIGURATION AND EXPLAINABILITY



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### CONCLUSIONS AND FUTURE WORK: CHALLENGES AND OPPORTUNITIES OF MPC KEY TAKEWAYS





# World of smart solutions is evolving fast

Renson at forefront of creating healthy spaces with smart, connected solutions!



# Different controllers with different benefits

Select appropriate controller based on use case and requirements!



# MPC is a promising technique

POC demonstrates the potential of MPC for creating healthy spaces 2.0



# **MPC challenges are configuration and explainability** How to make MPC transparent and understandable for stakeholders?



# Let's develop further

Still many challenges to tackle, while learning from eachother



#### CONCLUSIONS AND FUTURE WORK: CHALLENGES AND OPPORTUNITIES OF MPC QUESTIONS – IDEAS – SUGGESTIONS

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