# A Multi-Autonomous Mobile Robot Controller for **Autonomous Agent Perception and Collaboration**

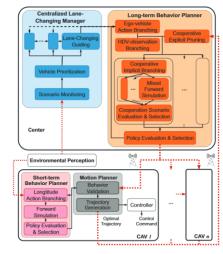
# INTRODUCTION

Multi Autonomous Mobile Robots (AMR) represent the most diverse and widely applied category of autonomous agents in current industrial automation. They autonomously handle cargo transportation and have become a crucial component of automated production systems for enterprises.

The multi-AMR controller targeting edge-cloud collaboration to utilizes heterogeneous multi-core processors, making full use of resources such as multiple cores in the Zyng MPSoC's processing system (PS) and programmable logic (PL).

	APU sensor		] [		RPU sensor
3D camera	UWB	LIDAR		Encoder	Drive Photoelectric switch
сом	Monitor	Camera		Power	Code reader Acousto-opti
APU data					RPU data
Interface	USB	GigE	Processing System	Interface	COM CAN
5G	WIFI	DP		ю	AD DA
APU OpenAMP OpenAMP RPU					
COM	v	Motion	State		Controller
Data alig Obsta		Local Bessel generation	Perception		Motion solving
Positio	ning P	review point	Depth completion		Manual operation
Local-cos		generation Preview point	Target detection and tracking		Obstacle avoidance
Cloud- Communi	end s	tracking peed control	HiPU 500 Deep neural network		Safety protection
processor					
			AXI BUS		
Programmable Logic Rs485 COM GigE Counter					
			PL data PL sensor		
			Camera LiDAR		

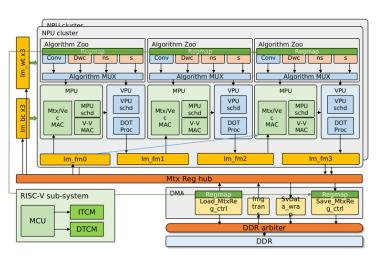
Heterogeneous multi-core computing architecture



A real-time framework for AMR Introducing a real-time framework for AMR lane changing, merging decision-making and motion planning. **Extending POMDP for** multi-AMR scenarios with cooperation mechanisms for improved efficiency

and safety.

## **Dynamically Clippable Neural Network Acceleration Kernel**



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2. Object detection result

On board test by AMD ACU3EG

### **Perception results**

1. Positioning result



**Repeated positioning** accuracy: 20mm **Output frequency: 100Hz** Point cloud matching frequency: 0.5Hz

Detect frame rate: 10Hz 2D detection accuracy: >0.75 2D detection recall rate: >0.90 Network parameter quantity: 2.59M

### **Planning results**

Multi AMR cooperation to avoid dynamic obstacles





