Pragmatic Heterogeneous Collaborative Perception via Generative Communication Mechanism

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Motivation

Pragmatic Heterogeneous Collaboration:

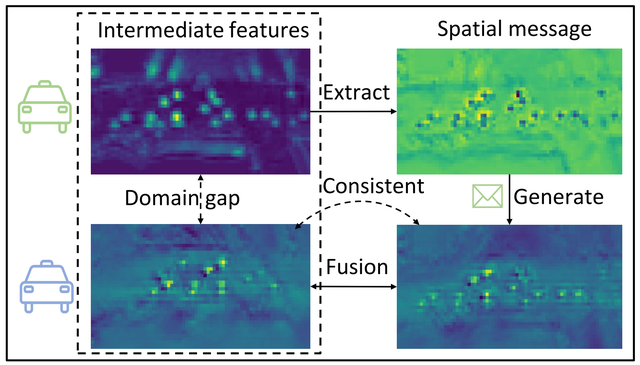
- **No-intrusive to legacy model**
- **Scalable**
- **Plug & Play**
- **Private & Secure**

Generative **Comm**unication Mechanism

GenComm

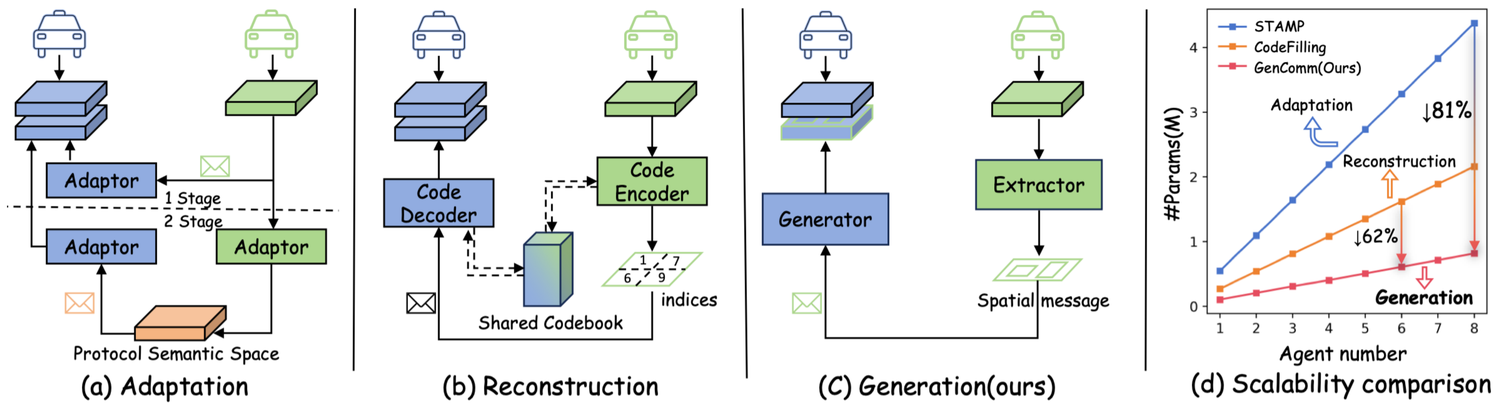
Key idea

- **Generate features consistent with ego features.**
- **Preserve collaborators' spatial information.**



Comparison

A comparison with existing paradigms of heterogeneous collaboration.



Experiments

- **3** Datasets: OPV2V-H & DAIR-V2X & V2X-Real
- Settings: **2** Modality & **4** Encoders(categories and scales)
- Scenarios: Static & Dynamic
- **Robustness**: Pose error & Time delay

Take the dynamic scenario on OPV2V-H as an example

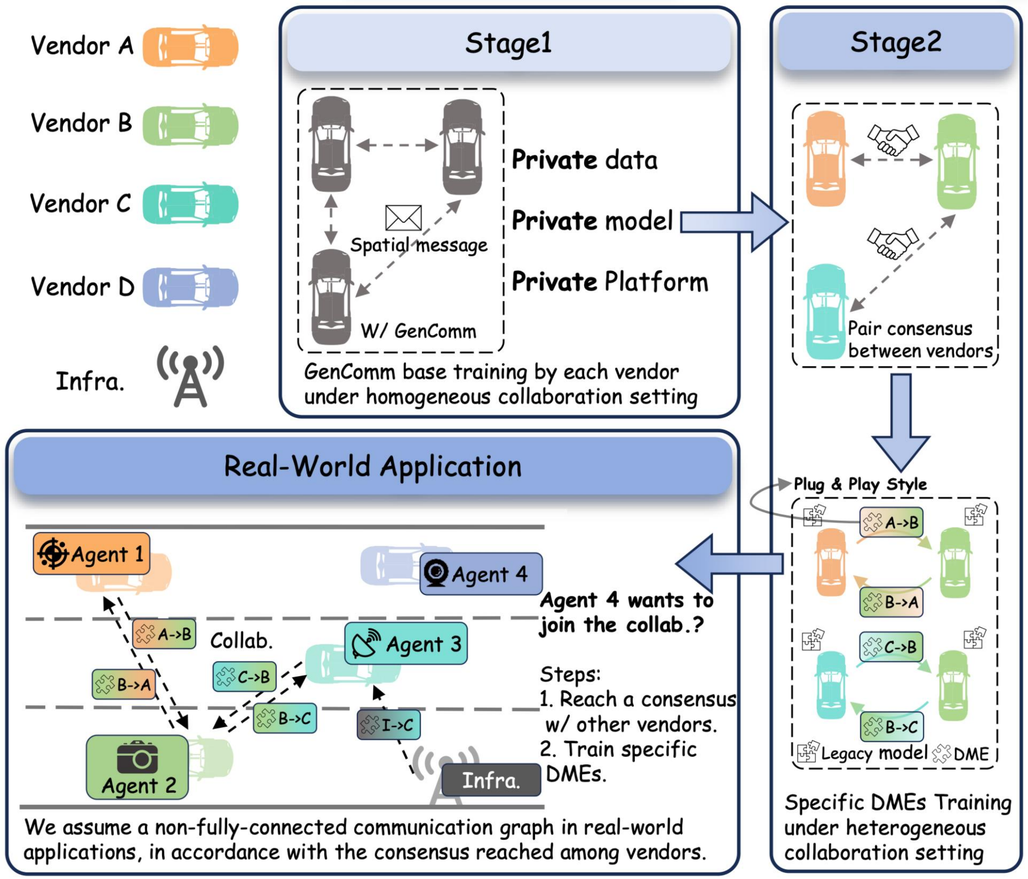
- Superior performance
- Minimal resource cost
- Communication efficiency

OPV2V-H

Method	$L_P^{128}+C_E$ AP50 ↑	$L_P^{128}+C_E$ AP70 ↑	$L_P^{128}+C_E+L_S^{32}$ AP50 ↑	$L_P^{128}+C_E+L_S^{32}$ AP70 ↑	$L_P^{128}+C_E+L_S^{32}+C_R$ AP50 ↑	$L_P^{128}+C_E+L_S^{32}+C_R$ AP70 ↑	#P(M)↓	#F(G)↓
MPDA[9]	0.7574	0.5497	0.6513	0.4786	0.6815	0.5123	5.75	51.93
BackAlign[12]	0.6975	0.5288	0.7238	0.5398	0.7252	0.5408	31.18	211.38
CodeFilling[13]	0.6891	0.5234	0.637	0.4658	0.5981	0.4316	0.81	12.91
STAMP[11]	**0.7609**	0.5878	0.7819	0.5995	0.7829	0.6002	1.64	3.084
GenComm	0.7538	**0.5951**	**0.7873**	**0.6174**	**0.7866**	**0.6184**	**0.31**	**0.615**

Application Rational

- Stage1: GenComm base training under homogeneous collaboration
- Stage2: Specific **D**eformable **M**essage **E**xtractors training under heterogeneous collaboration
- New agents join the collaboration by reaching a consensus with other vendors and training specific DMEs.



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