The sensor and basic information processing form a unit: a sensor-computational device with finitely many states. The core notion of behavioral equality is through the lens of a relation.

Definition 3 (output simulation module a binary relation). Given sensor-computational devices $F$ and $F'$, and relation $\equiv$ over $\mathcal{L}$, if $F$ simulates $F'$ modulo $\equiv$, then $F \in \mathcal{L}(F')$. This work contributes theory and algorithms (plus a hardness result) to A self-driving car, shown below, moves on a highway and is equipped with on-board sensors to detect the vehicle's current lane $\in \left\{0, 1, 2\right\}$. To construct a sensor reporting a change in lane, consider the space $\mathcal{D}_\Delta (\equiv (\text{LEFT}, \text{NULL}, \text{RIGHT}))$ and treat the following function as a ternary relation: $\delta_{\text{null}}(x, y, z, w) \equiv w(x, y, z, w)$, which is shown in Figure 3. Then, this transforms any sequence of lane occupations into unique lane-change signals in a lane road.

Definition 4 (Arithmetic changes). For $x$, $y$, $z$, $w \in \mathcal{D}_\Delta$, the relation $\equiv$ is defined for all $x$, $y$, $z$, $w$. But if $\otimes$ is not a valid operator, although it is still hard to give it a consistent interpretation:

- Example 4 introduced $\mathcal{D}_\Delta (\equiv (\text{LEFT}, \text{NULL}, \text{RIGHT}))$. As there are three lanes, one might wish to combine, say, two RIGHT actions, one after the other. With only three elements, two RIGHT actions might map to a RIGHT (as that seems less wrong than LEFT or NULL), giving $\mathcal{D}_\Delta (\equiv (\text{RIGHT}, \text{NULL}, \text{RIGHT}))$.

Example 5 — Stability and clutter-free behavior

A Sima X9 Quadcopter Car, capable of both flight and wheeled locomotion, monitors a home environment. The robot is equipped with a single-pixel camera. It must fly to avoid grassy outdoors (F) and liquids in the pantry (P). In the bedroom (B), it should drive to minimize noise.

The robot is initially located in either the front garden (F) or the living room (L). To determine its state, the robot uses its single-pixel camera, which is capable of discerning just three different ambient light levels (Bright (B), Moderate (M), Dark (D)). The following four sensor-computational devices process light readings as input, and output the appropriate mode (driving (s)) on integers, for example: $\equiv (\text{RIGHT}, \text{NULL}, \text{RIGHT})$. An alternative that does yield a valid operator, although it is still hard to give it a consistent interpretation:

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