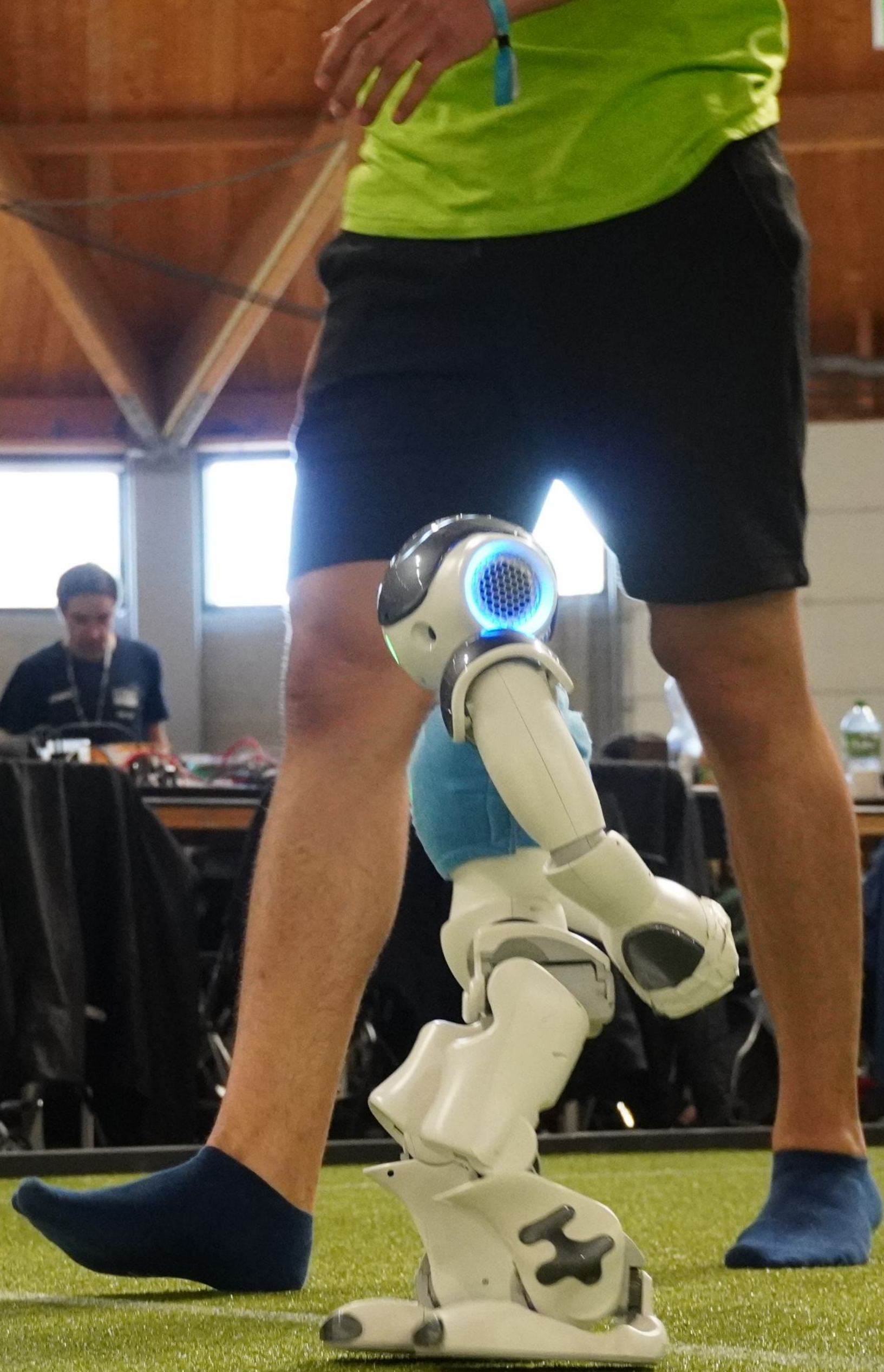
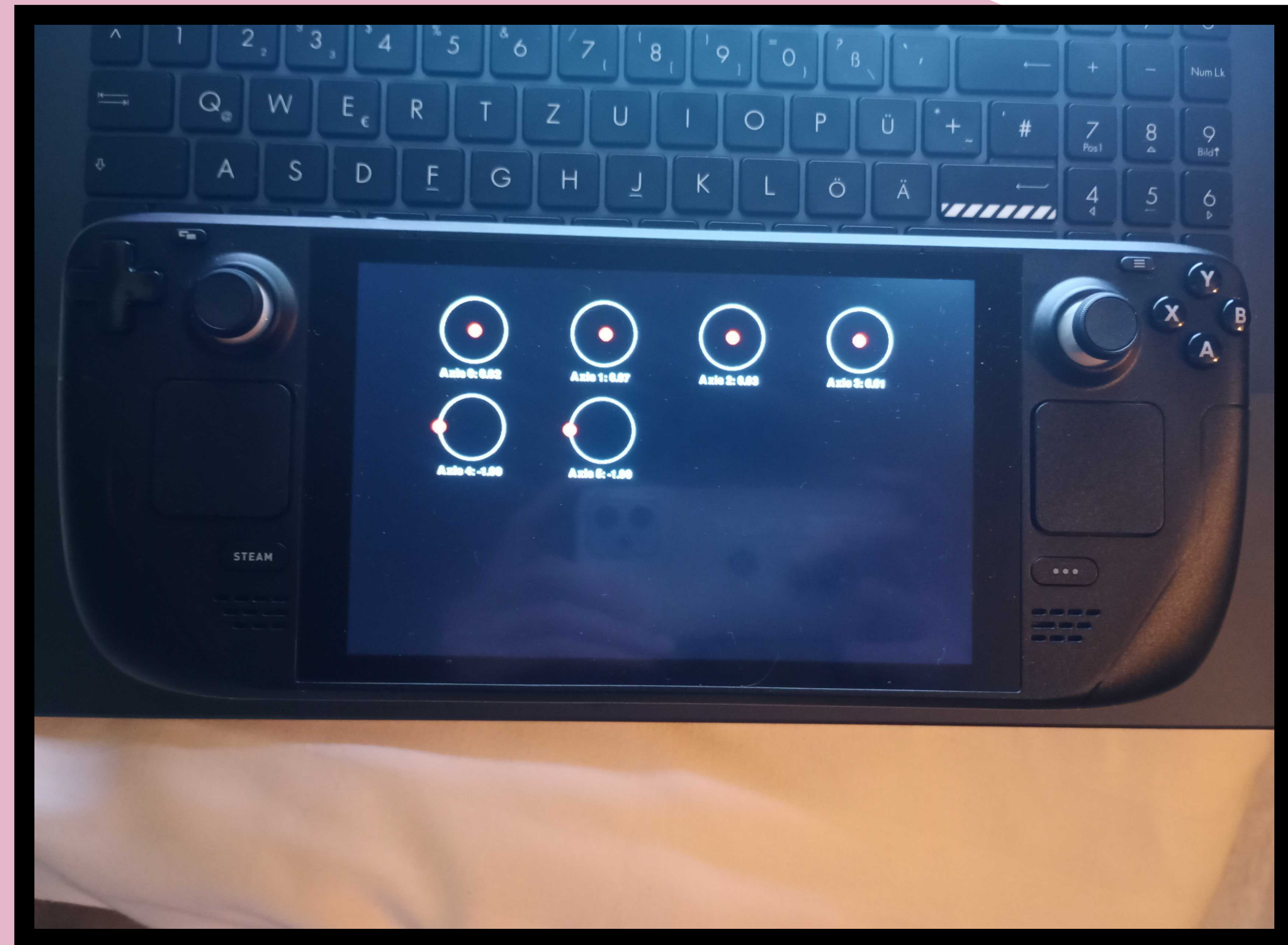


HTWK ROBOTS



Operator Commands I - controls

- **Steam Deck**
 - established controller design with central screen
 - joysticks for walking direction and rotation
 - R1/R2 for kick motion
 - communication trigger: A



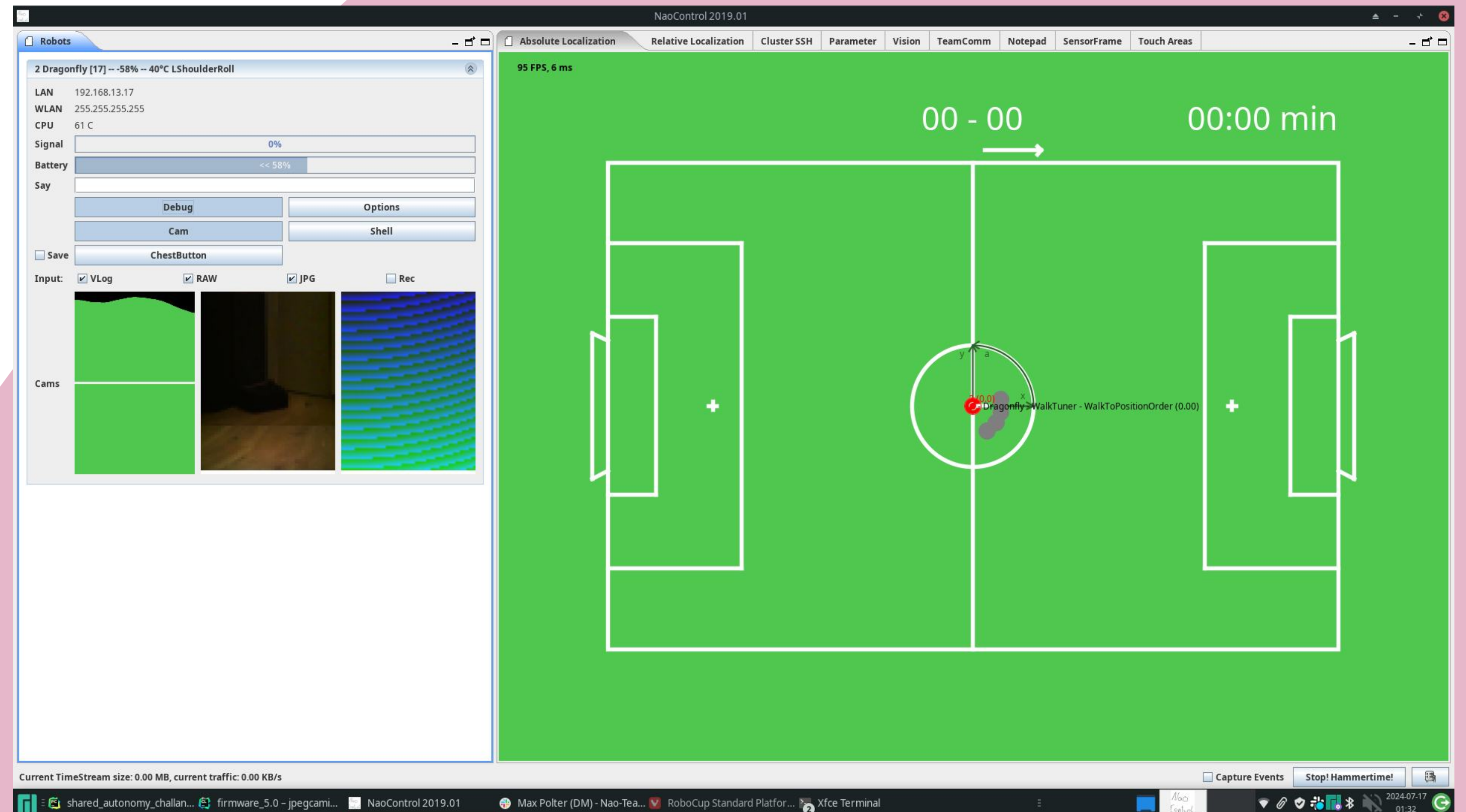
Operator Commands - integration

- **Steam Deck**
 - **establihed controller design with central screen**
 - **intuitive control akin to gaming standards**
 - **joysticks for walking direction and rotation**
 - **simultaneous walking & rotating possible**
 - **→ unique diagonal kicks**
 - **R1/R2 for kick motion**
 - **unstable kicks auto-delayed**
 - **communication trigger: A**
 - **world model update**

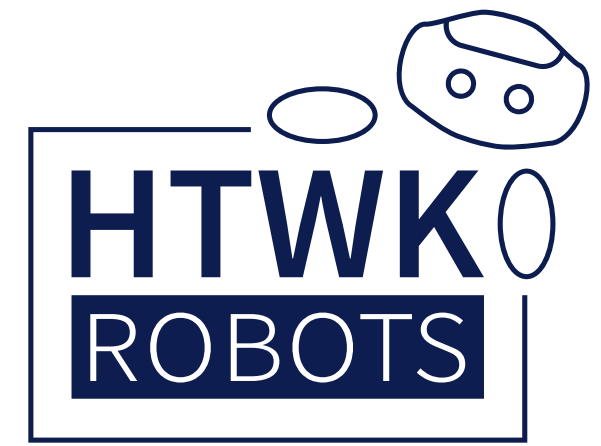


Human Interface - Data Supervision

- **Sensor Data Stream (left side)**
 - raw: upper and lower camera merged into central panel
 - partial processing: ball detection, sub-procedure, world model details
 - → manual supervision wm
- **World Model visualization**
 - self-localization
 - here: absolute
 - obstacle identification
 - ball detection
 - path planning
- **robot communication**
 - A button triggered
 - world model update



Coordination Strategy



- **utilization of previous technical challenge**
 - **Dynamic Ball Handling**
 - **passing**
- **unique diagonal kicks**
 - **largely impossible in autonomous play**
 - **due to broad destabilization**
 - **high probability for pushing**
 - **in autonomous play usually unintended and emergent**
 - **diagonal kicks are unpredictable**
 - **lead to break-down in ball detection**
- **offensive maneuver:**
 - **autonomous robot charges forward, operated robot passes**
- **defensive maneuver**
 - **operated robot blocks, opportunistic positioning of autonomous robot for taking over the ball after a duel**