

RainCheck: Overcoming Capacitive Interference Caused by Rainwater on Smartphones

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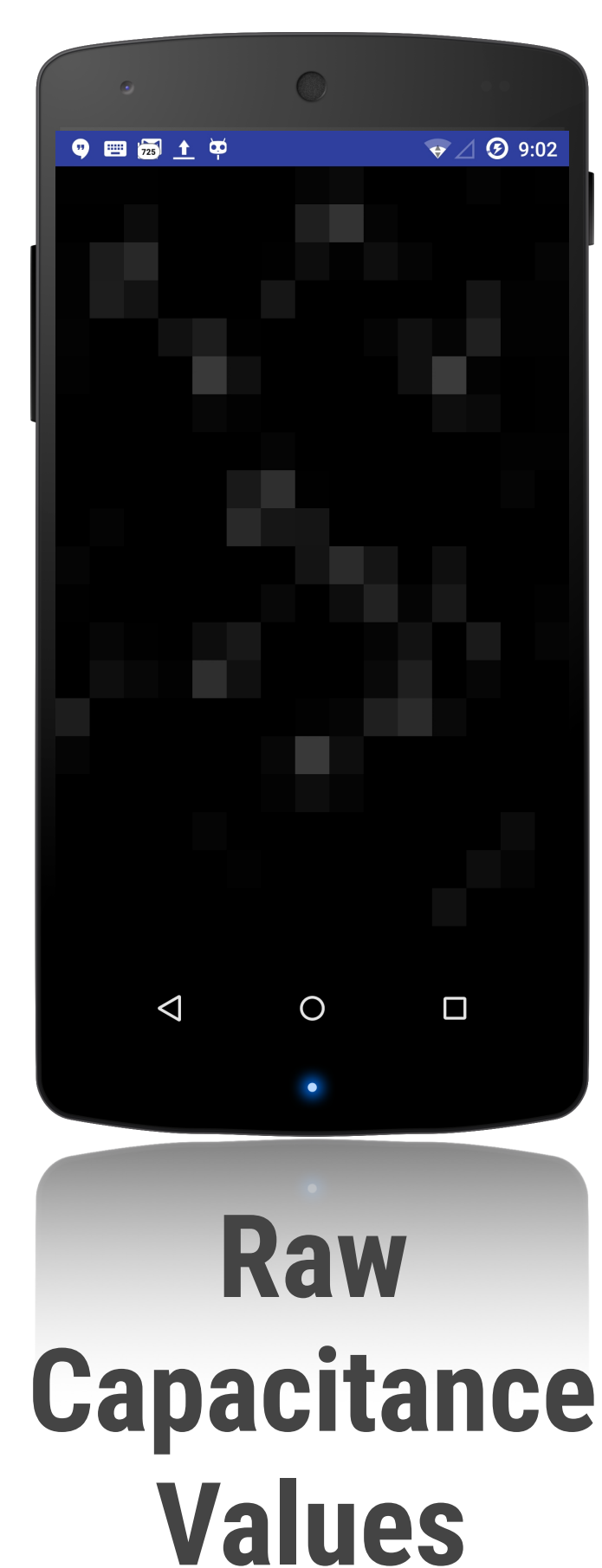
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Motivation

Modern smartphones are built with capacitive-sensing touchscreens, which can detect anything that is conductive or has a dielectric differential with air. The human finger is an example of such a dielectric, and works wonderfully with such touchscreens. However, touch interactions are disrupted by raindrops, water smear, and wet fingers because capacitive touchscreens cannot distinguish finger touches from other conductive materials. When users' screens get wet, the screen's usability is significantly reduced.

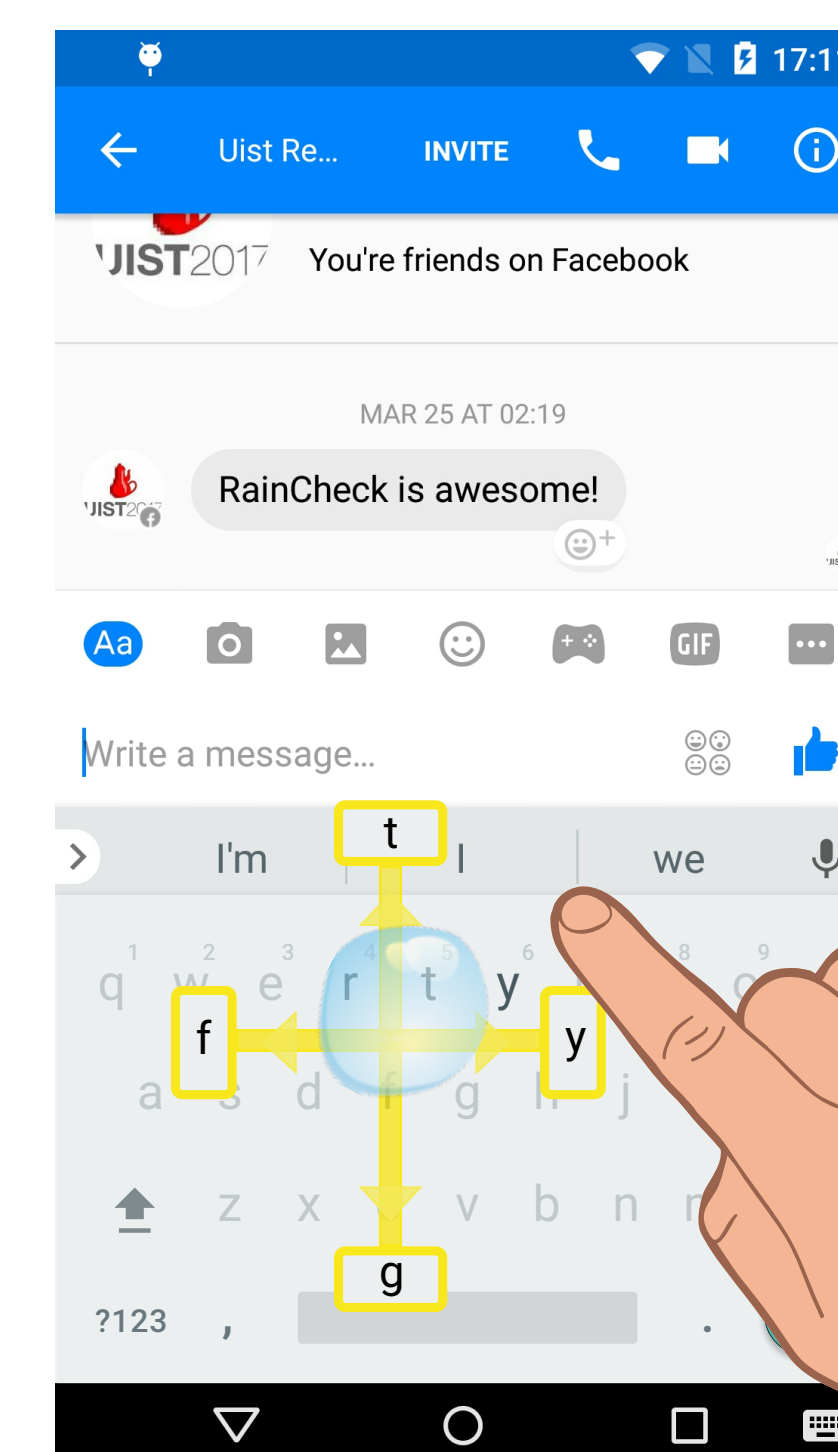
System



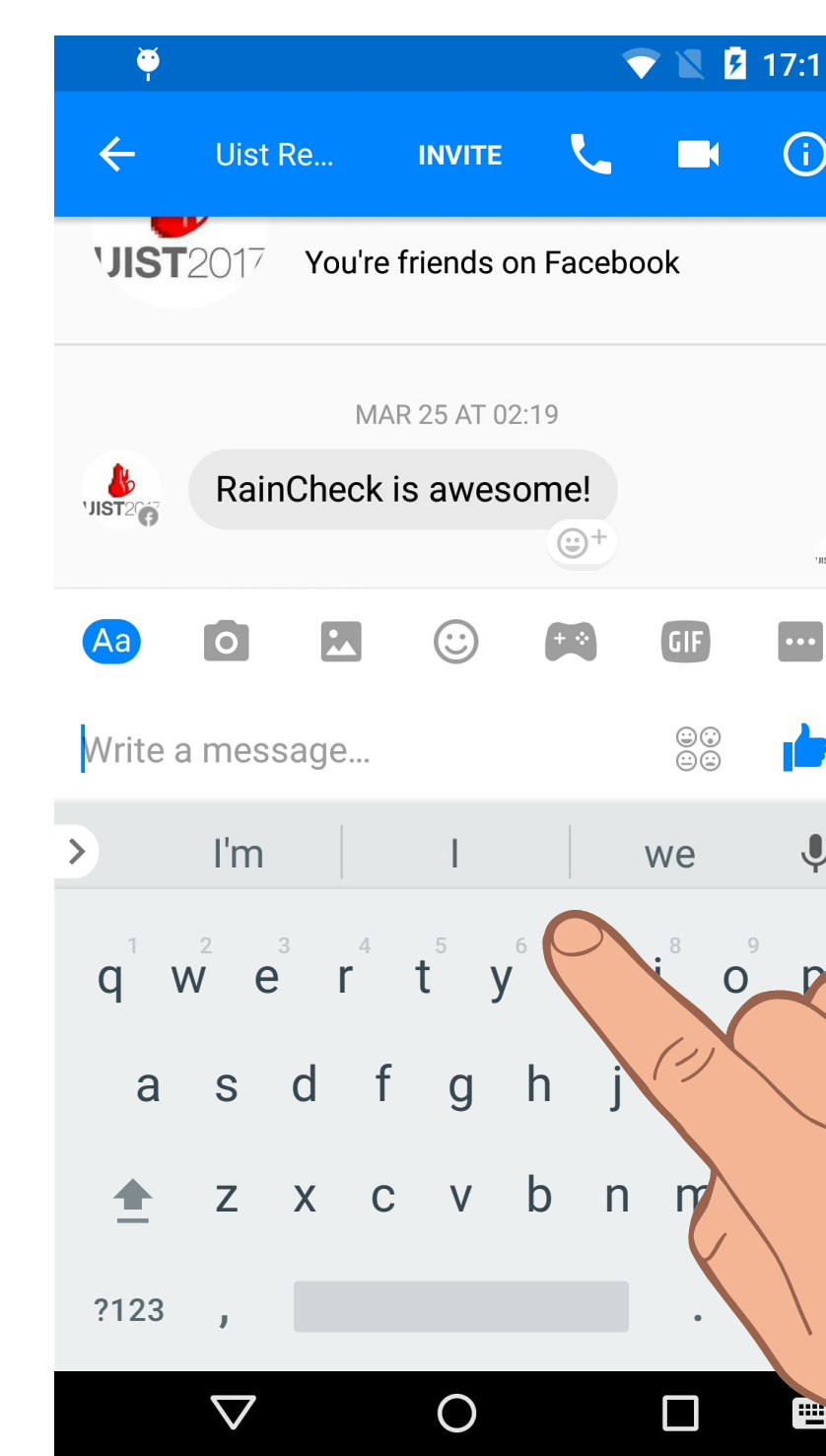
RainCheck Filtering Algorithm

Touch Point Unresolvable

Touch Point Resolvable



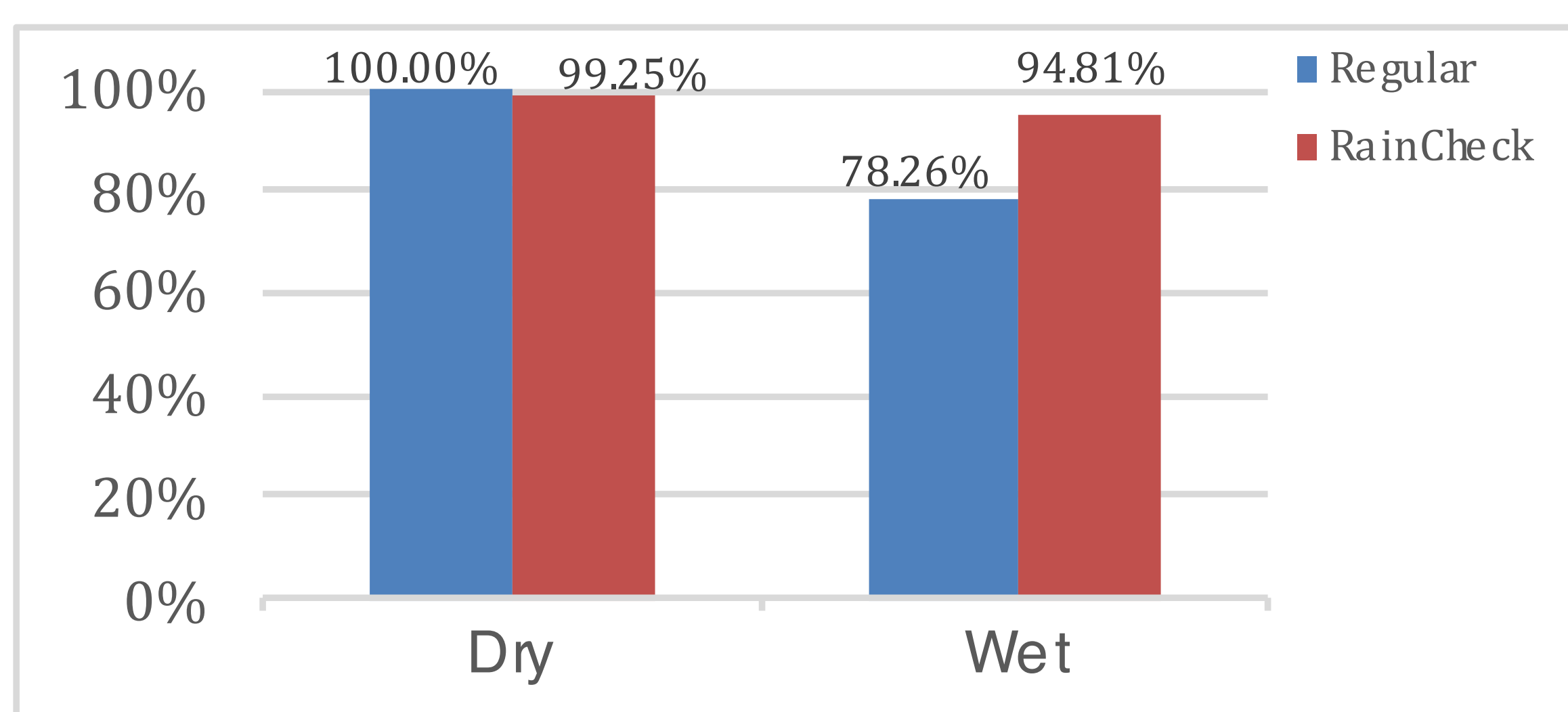
Swipe-Based Disambiguation



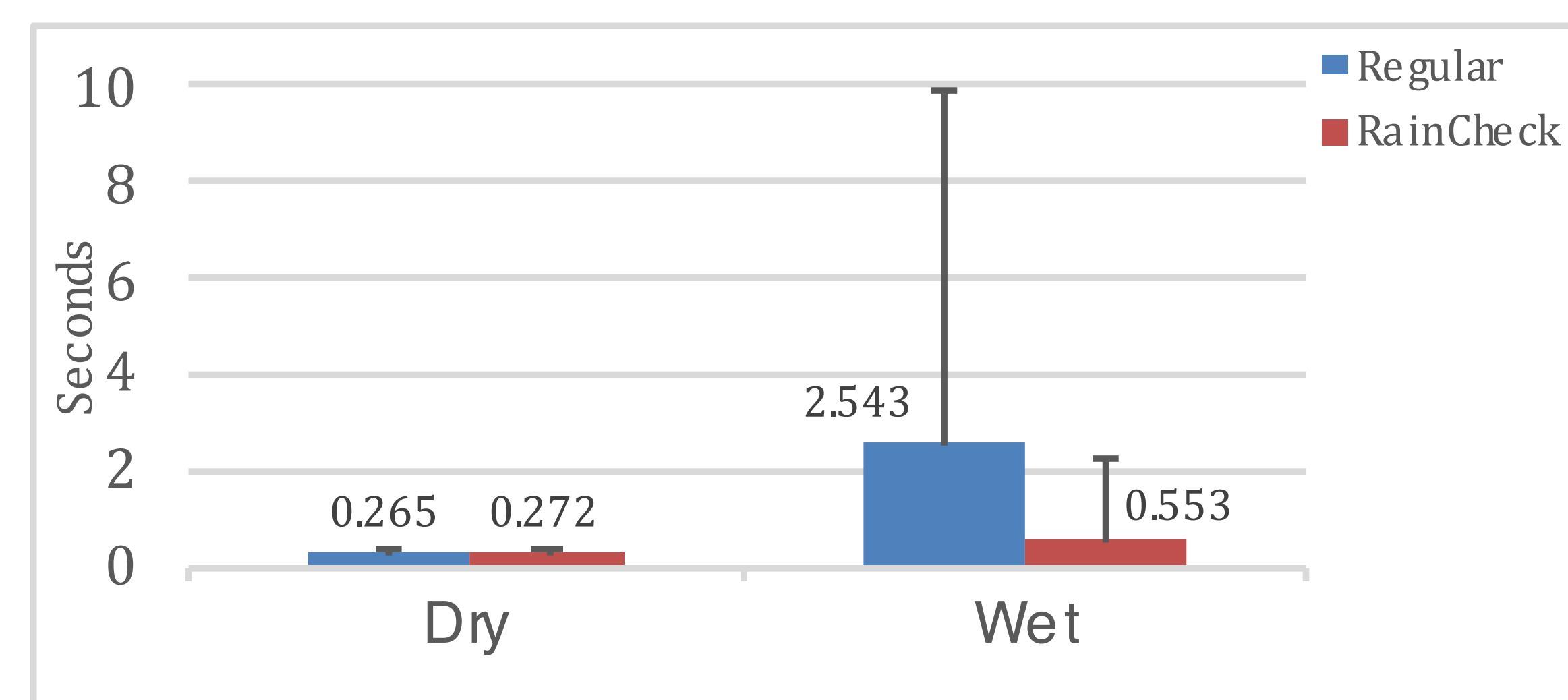
Tap-Based Interaction

Results

The first study evaluated the filtering performance with 6 gesture types in dry and wet conditions. Gestures included swipe in 4 directions and pinch in/out. **Overall, RainCheck resulted in a 75.7% reduction in errors in the presence of water on the touchscreen.**



Study 1: RainCheck's filtering performance



Study 2: RainCheck's disambiguation technique

The second study evaluated RainCheck's disambiguation technique for improving the target selection with water drops on the touchscreen. Average selection times of the unmodified system and RainCheck were 2.543 seconds and 0.553 seconds, respectively. **RainCheck reduced selection time by 80.0%.**