Controlling virtual characters in AR games for modern smartphones is even more challenging than in ‘pure’ VR games because the player has to keep the AR world in view. We propose six interaction concepts based on combinations of both physical and virtual buttons and sensor input. We suggest an evaluation according to game experience criteria.

### Game Concept

<table>
<thead>
<tr>
<th>Interaction Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characters in mobile games are usually controlled using on-screen control elements. But the more control elements are placed on the screen, the higher the risk of occluding important parts of the game with the user’s fingers. This might have a negative effect on the game experience and can make it difficult to control it in a real-time environment.</td>
</tr>
<tr>
<td>We propose six different input methods to compare their effect on game experience in mobile augmented reality games.</td>
</tr>
</tbody>
</table>

### Touch-based Virtual Joystick

A virtual joystick is on the screen. The position of a touch in relation to the center of the joystick defines its position. The movement of the avatar on the screen directly follows the direction of the joystick.

### Physical Gestures

Modern smartphones offer additional sensors like gyroscopes or accelerometers which can be used as input in games. They react to movements like tilting, rotating or shaking of the device. The sensor input is mapped to the movement of the avatar.

### Touch-gesture Control

Swipe gestures are well established to interact with smartphones. They are used to initiate the movement of the character in the indicated direction. Tapping on the screen stops the movement.

### Field-of-view-based Continuous Control

Instead of requiring the user to select a specific point, the destination is continuously updated to the center of the camera’s current field of view. Moving the device and thereby the AR viewport allows the player to control the character.

### Touch-based Absolute Control

The user sets the location in the AR world by tapping on a point on the screen. The destination is projected into and set in the AR world, so moving the device does not change the target position in the AR world.

### Physical Control Buttons

Some devices still have physical keyboards which can be used to move the player model relatively to its current position with a set of predefined keys, analogous to many desktop games.