Physical Unclonable Function (PUF)

- Function based on physical system
- Each electronic device has unique physical properties
- Arise due to random variations in the manufacturing process
- Source of randomness for PUF
- Forms a “fingerprint” of the device

PUF’s applications

- Device identification
- Authentication
- Cryptographic key generation
- Instead of storing the keys in memory

PUF proposal

- Delay-based PUF
- Random variations in delays of logic gates and their interconnects
- Affects frequencies of ring oscillators (RO)

Selection of suitable positions for PUF

- Easy to implement PUF design
- Multiple output bits from each RO pair
- Stable and unique PUF responses
- Influence of voltage and temperature on stability is investigated

Results

<table>
<thead>
<tr>
<th>Positions</th>
<th>7-8</th>
<th>7-9</th>
<th>7-10</th>
<th>8-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>w</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>( HD_{\text{intra}} )</td>
<td>1.37%</td>
<td>1.77%</td>
<td>2.71%</td>
<td>2.63%</td>
</tr>
<tr>
<td>( HD_{\text{inter}} )</td>
<td>48.49%</td>
<td>49.06%</td>
<td>49.32%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Publications

- 2 articles in impact journals
  - Kodýtek, F.; Lórencz, R.: Proposal and Properties of Ring Oscillator-Based PUF on FPGA. In Journal of Circuits, Systems and Computers
  - Kodýtek, F.; Lórencz, R.; Buček, J. Improved ring oscillator PUF on FPGA and its properties. In Microprocessors and Microsystems
- 3 publications on IEEE conferences
- 5 publications on international workshops