POSTER: TinPal- An Enhanced Interface for Pattern Locks

Title – TinPal: An Enhanced Interface for Pattern Locks
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Affiliation – TCS Research, Pune, India
Venue – To appear in Workshop on Usable Security (USEC 2018), co-located with NDSS 2018, San Diego, California
Date – 18 February 2018
Link/Doi – To appear in USEC 2018 (Submission Number 21)


Abstract-
Pattern lock scheme in which users connect 4-9 dots in a 3X3 grid is one of the most popular authentication methods on mobile devices. However, numerous research studies show that users choose patterns from a small space which makes them vulnerable to a variety of attacks such as guessing attacks, shoulder-surfing attacks and smudge attacks.
In this work, we enhance the existing 3X3 interface with a visual indicator mechanism and demonstrate how this slight modification can influence users’ pattern choices, thereby improving the security of the pattern lock scheme. We refer to this enhanced interface as TinPal. As users draw their pattern, TinPal highlights the next set of unconnected dots that can be reached from the currently connected dot. We gauge the impact of this highlighting mechanism on users’ pattern choices by performing a comparative study of two groups, where one group creates pattern using the existing interface while the other group creates pattern using TinPal. The study results show that participants who used the TinPal interface created more secure patterns than participants who used the existing interface.
User-selected 3X3 patterns are simple and drawn from a very small space. Pattern Lock Scheme is one of the most popular authentication schemes on mobile devices. The rules for creating 3X3 patterns are as follows:

- Rule 1: At least 4 dots must be chosen.
- Rule 2: No dot can be used twice.
- Rule 3: Only straight lines are allowed.
- Rule 4: Do not jump over dots not visited before.

The total number of possible 3X3 patterns is 389,112.

Rules 1, 2, and 3 are enforced by existing 3X3 interface. However, this interface does not have any mechanism to inform users about Rule 4.

Popular 3X3 patterns:

- Dot 3
- Dot 8
- Dot 5
- Dot 1
- Dot 6
- Dot 4
- Dot 2
- Dot 7
- Dot 9

A step-by-step illustration of creation of pattern 385196427 on the enhanced 3X3 interface.

We used two design principles to enhance the Existing 3X3 Interface, namely visibility and consistency.

Memorability and efficiency results show that the usability of the Enhanced Interface is comparable to the Existing Interface.

Pattern cracking results:

- We measure the guessing resistance of patterns using n-gram Markov model.
- We train Markov models on two data sets, one collected in our present study USEC/18 and the other from our ASIACCS’17 paper (69,797 patterns).

Pattern characteristics and cracking results show that patterns created on Enhanced Interface are more secure.

References:

- Panagiotis Andritsos et al. A pilot study on the security of pattern screens-lock methods and soft side channel attacks. In WiSec ‘15.
- Youngbae Song et al. On the Effectiveness of Pattern Lock Strength Metrics: Measuring the Strength of Real World Patterns. In CHI ’15.

Graphical data and charts illustrating user demographics, recall attempts of patterns, and creation and recall time of patterns.