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University of Padua – Department of Information Engineering

Bachelor's Degree in Information Engineering

Final Report

Electronic Control Access: A passing trend or a new standard?

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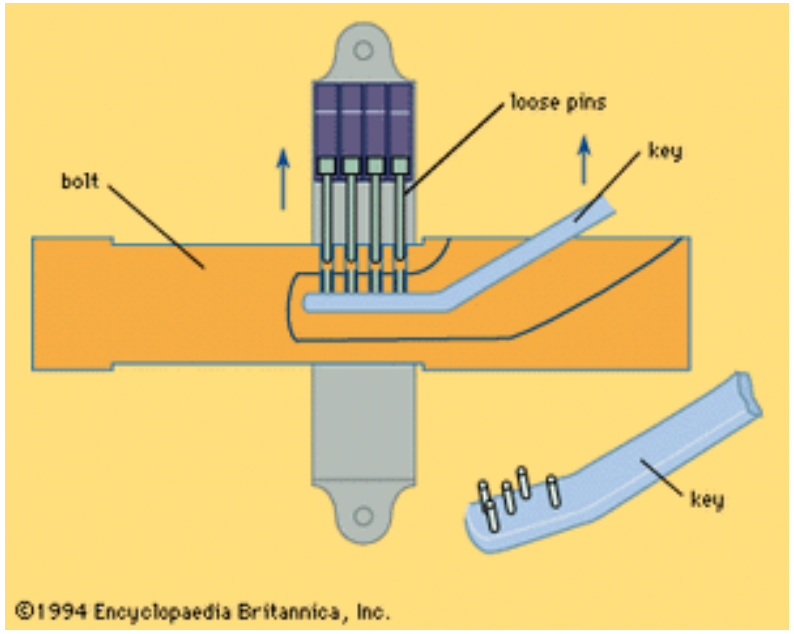
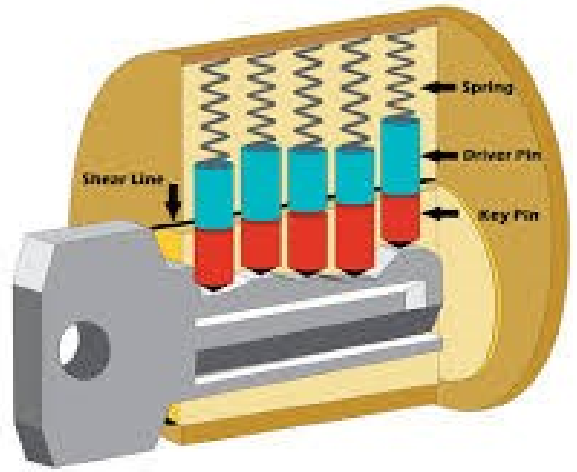
INTRODUCTION



Among the earliest instances of usage of locks, Egyptian lock



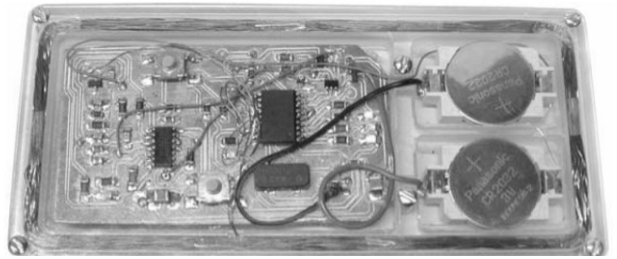
Modern pin tumbler lock, designed after the mechanism of the Egyptian lock

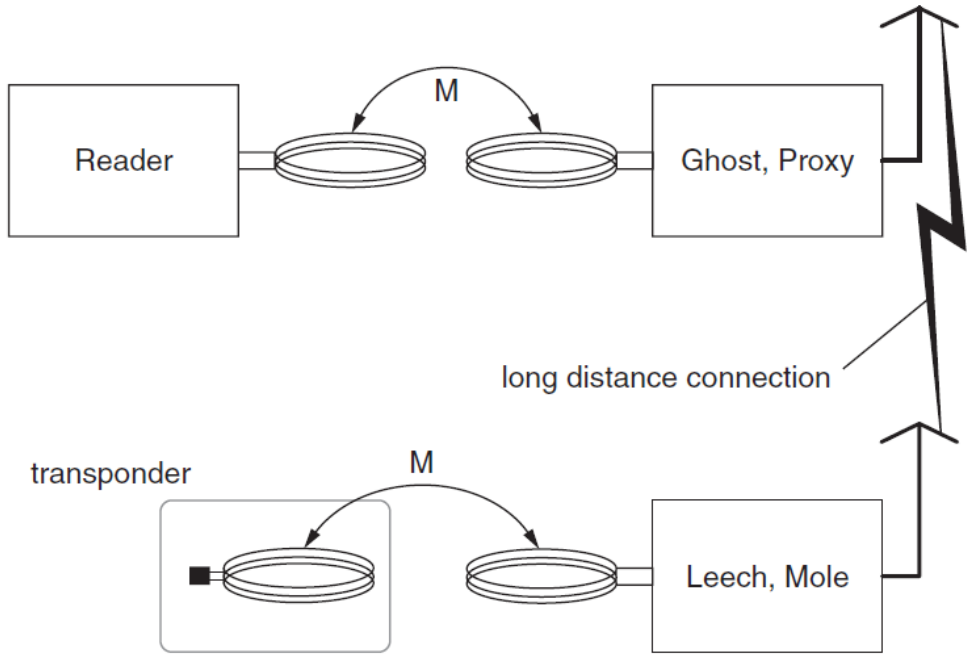
RFID for Control Access

- RFID stands for Radio Frequency IDentification
- First used in WWII as part of the IFFF system
- The system consists of tags/cards, readers, and backend database
- Many variations of RFID systems exist
- Reader supplies power, and the clock cycle to be used to transmit the data from the tag to identify the user

Potential attacks on RFID Control Access System

- Spoofing attack
  - Potential solution: Encryption (Mutual symmetric authentication)

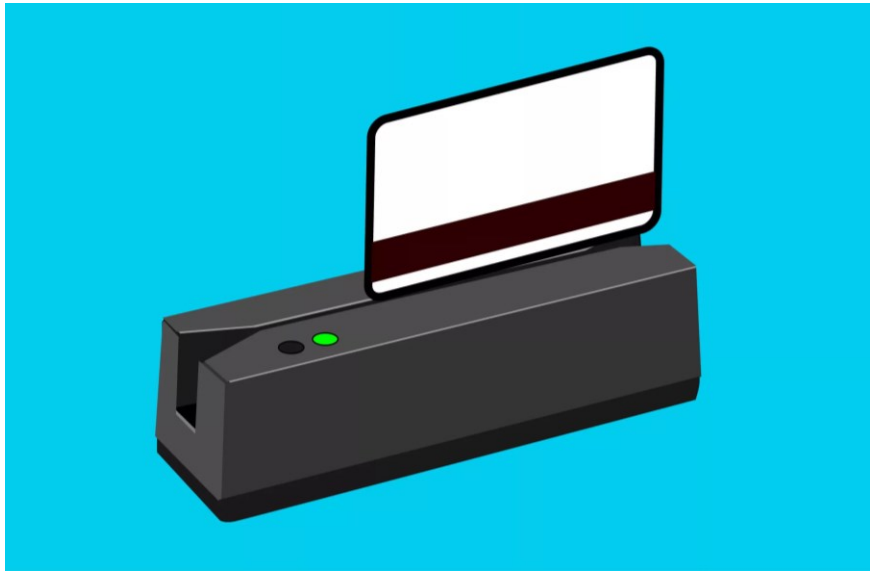


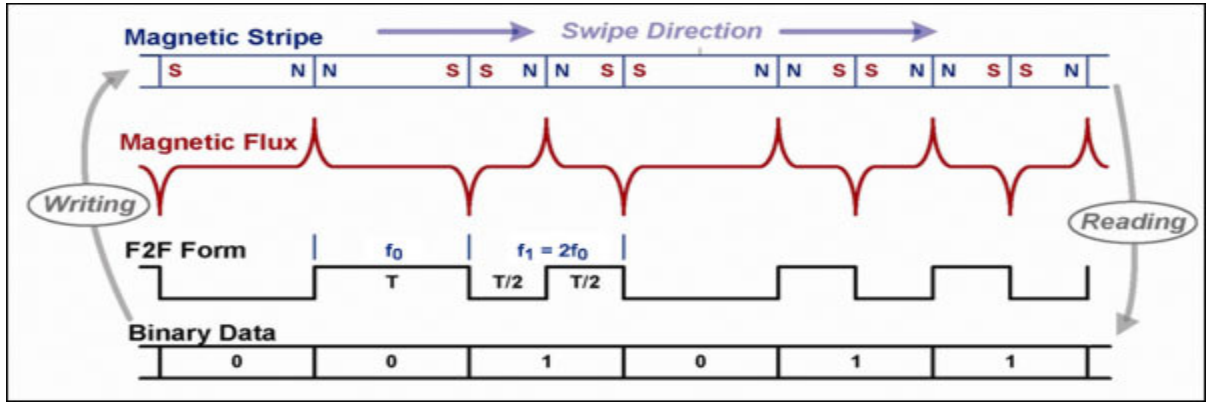


- Relay attack
  - Potential solution: Distance bounding protocols

Magnetic Stripe for Control Access

- First used for speech recording
- Uses multiple tracks
- Coercivity (Oersted)
- Differential Manchester encoding (F2F)



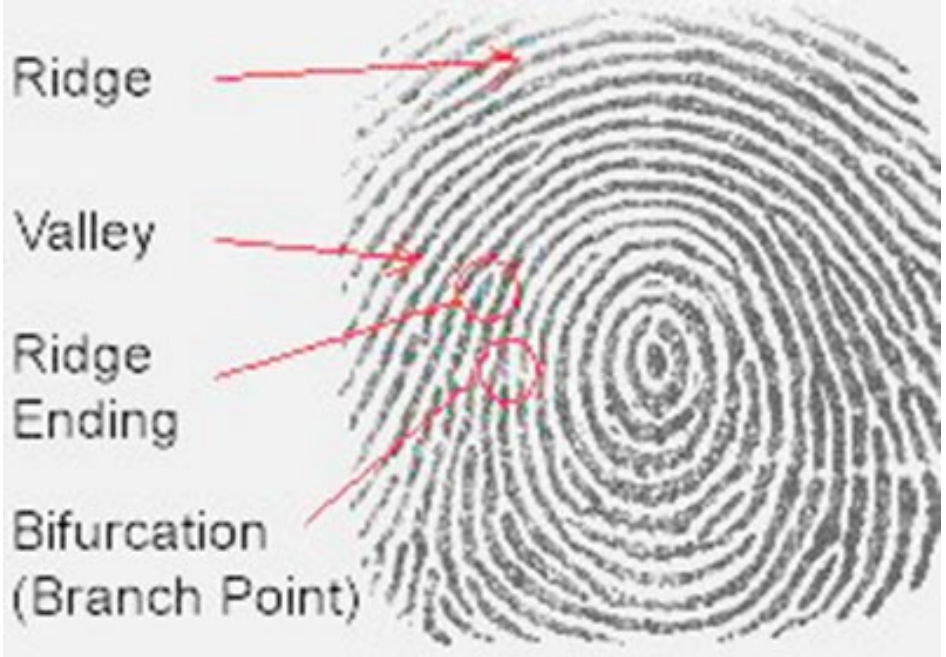


Potential attacks on Magnetic Stripe Control Access System

- Main way of attack is skimming
- Pin code skimming
- Potential solution: Image processing

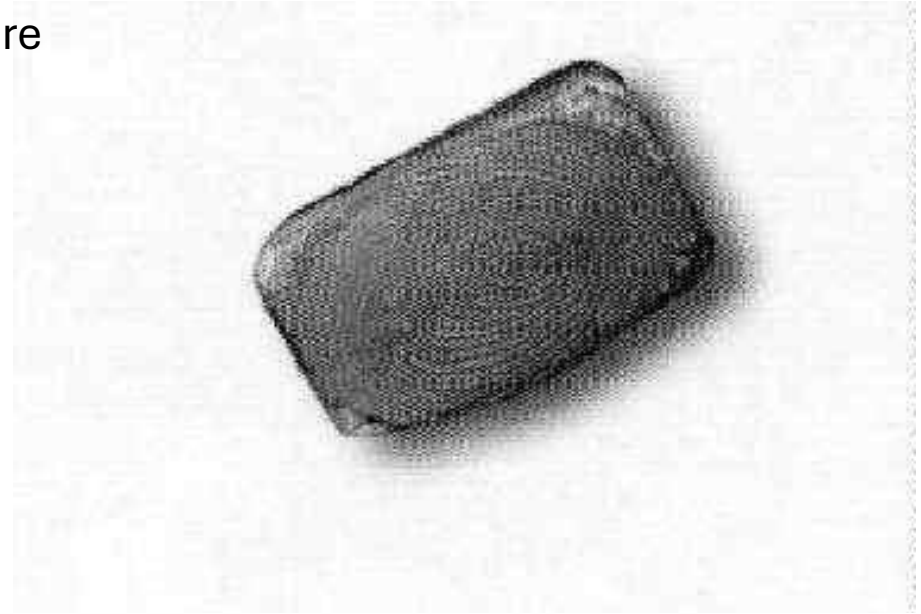
Biometrics (Fingerprint recognition) for Control Access

- First used in ancient Babylon to identify merchants
- Sensor scans the fingerprint (optical, thermal)
- Minutiae
- Types, coordinates and direction
- Comparison
- Threshold check



Potential attacks on Biometrics (Fingerprint recognition) Control Access System

- Presentation attack (copying a fingerprint without cooperation)
- Potential solution: Pairing with another identification procedure



- Hill climbing attack
- Potential solution: Quantization of the matching score

Comparison

	Traditional locks	RFID	Magnetic stripe	Fingerprints
Distance of the attacker	Physical/ Completely remote	~10m	Physical	Physical/ Completely remote
Upgradability of the system	Security pins	Encryption/ Distance bounding protocol	Limited	Minutiae matching/ Non uniform quantization
Drawbacks	Granting access to a large amount of people	Completely remote attacks	Demagnetization	False rejections

CONCLUSIONS

- No lock is unbreakable, no system unbeatable
- Control access mechanisms are just a part of the system
- Combination of systems is preferable
- Important to consider alternative bypass methods
- Educating the consumer on potential dangers

Pictures from:

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