The relevance of the Chinese Lotto: 25 years outsourcing of cryptanalysis

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1. NSA NEEDS A NEW SUPERCOMPUTER!

In November 2010 China had the largest (known) supercomputer.

Evidently, NSA might not have been happy with this.

So, we might imagine the following:


ALEXANDER

NSA director Keith B. Alexander

So, may be Keith B. Alexander went to beg:

Obama’s reaction:

Obama's reaction:

$17 trillion debt!

“New” solution:

"New" solution: NSA could outsource the cryptanalysis to, e.g. China!

Quisquater-Desmedt already mentioned "obfuscation" (called covert computation) and presented a primitive solution to prevent outsiders learn the ciphertext, plaintext and key.

Where: Rump Session Crypto 1987 with title:

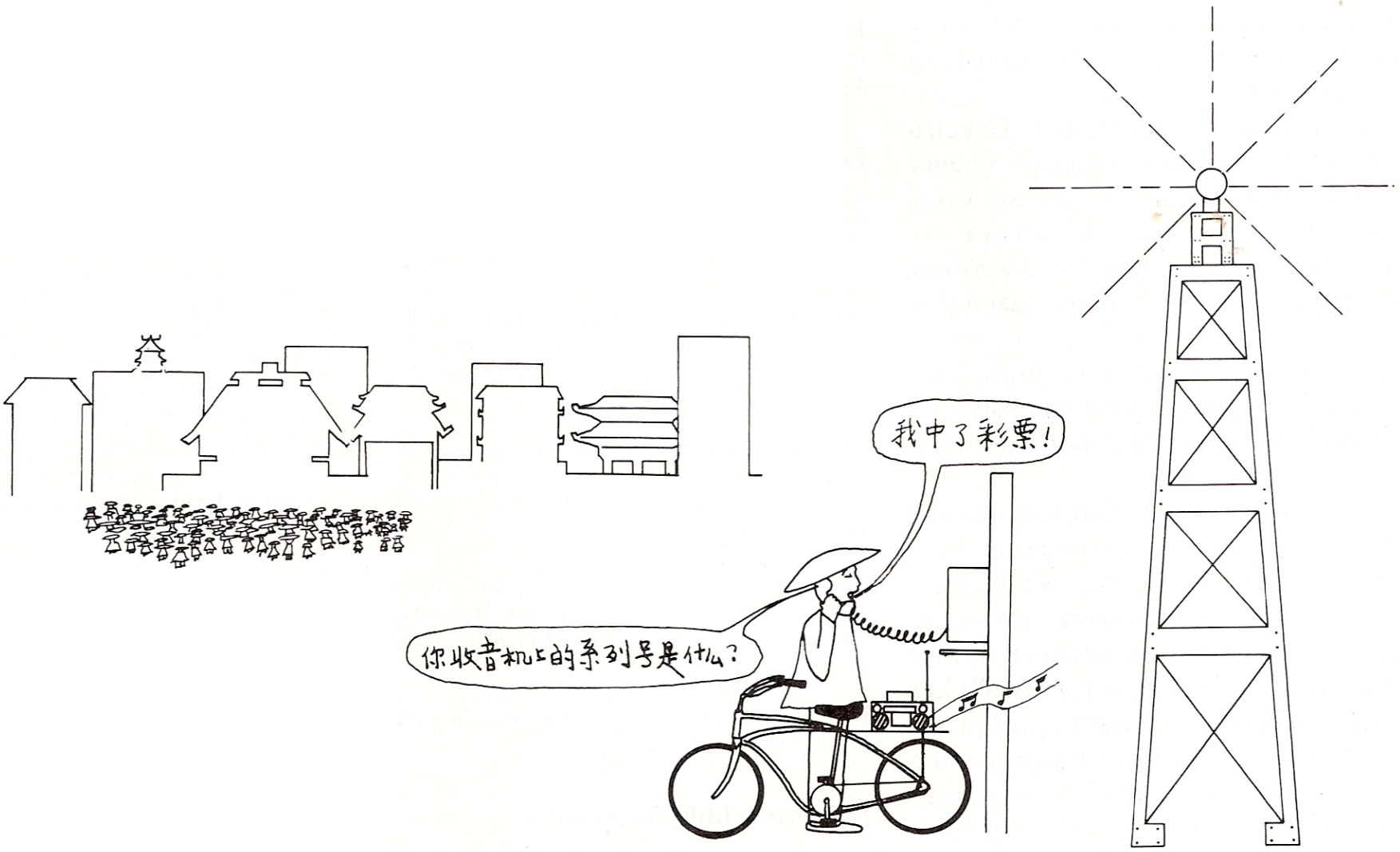
Watch for the Chinese Loto and the Chinese Dragon

Published: IEEE Computer 1991 with title:

Chinese lotto as an exhaustive code-breaking machine

Question: can obfuscation be done, or is this impossiby, using the work by Goldreich et al.?

2. APPROACH



Note: lotto did not exist in China! So, translation was not so trivial.

Today it does, so we predicted the existence of lotto in China.

http://usa.chinadaily.com.cn/china/2011-07/28/content_13003279.htm

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From Chinese Media

Lottery winner may have hit $80m jackpot

Updated: 2011-07-28 11:17

By Zhang Jiawei (chinadaily.com.cn)

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China's lottery may have set a new record with a man expected to win 514 million yuan ($80 million) from two tickets bought in East China's Zhejiang province on Tuesday, beating the previous record win of 359.9 million yuan, claimed by a man in Central China's Henan province in 2009.

The Chutian Metropolis Daily reported Thursday two tickets sold within 34

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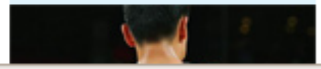

3. WHAT ELSE DID WE PREDICT?

- Outsourcing to China!

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- Outsourcing to China!
- Serious claims:
  - our idea to distrubute exhaustive search predated Lenstra-Manasse.
  - our idea to use bio-computing predated Adleman's DNA computing.

4. CURRENT IMPACT

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However, we found that many passwords are too short.

If using English (assume 5 bits entropy) only:

# characters	# passwords	1 PC	1 GPU	2^{60}/second
6	2^{30}	4 min.	1/4 sec.	2^{-30} sec.
7	2^{35}	2 hours	8 sec.	2^{-25} sec.
8	2^{40}	3 days	4 min.	2^{-20} sec.
9	2^{45}	3 months	2 hours	2^{-15} sec.
10	2^{50}	8 years	64 hours	2^{-10} sec.
11	2^{55}	NA	3 months	2^{-5} sec.
12	2^{60}	NA	8 years	1 sec.

Charset of 96 characters (from a keyboard):
rounded to 96 = $2^{6.5}$

# characters	Number of possibilities	1 PC (2^{22}/sec)	1 GPU (2^{32}/sec)	Rainbow table	Distributed.net boinc, botnets (2^{40}/sec)	Big one (2^{60}/sec)
6	2^{39}	32 hours	2 min.	YES	1/2 sec	2^{-21} sec
7	$2^{45.5}$	6 months	3 hours	YES	1 min.	$2^{-14.5}$ sec
8	2^{52}	NA	12 days	YES	2 hours	2^{-8} sec
9	$2^{58.5}$	NA	3 years	NA	8 days	$2^{-1.5}$ sec
10	2^{65}	NA	NA	NA	2 years	30 sec
11	$2^{71.5}$	NA	NA	NA	NA	1 hour
12	2^{78}	NA	NA	NA	NA	100 hours

Official recommendations for passwords:

For Ubuntu 7.10 (October 2007) manual for passwd:

> passwords should consist of 6 to 8 characters including one or more characters from each of the following sets: ...

in FreeBSD 8.1 (July 2010) they recommend:

> The new password should be at least six characters long (which may be overridden using the login.conf(5) "minpasswordlen" setting for a user's login class) and not purely alphabetic. Its total length must be less than `_PASSWORD_LEN` (currently 128 characters).

Finally, in "Digest Authentication" the hashed value is sent in the clear!

5. FUTURE IMPACT

In 1985 we predicted:

Quisquater and me disagree how long before this will become reality.

Quisquater favourite picture: