Random Oracles in a Quantum World

Crypto 2010 – Rump Session

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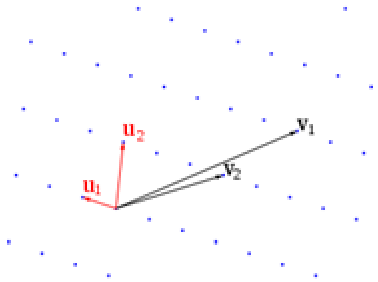
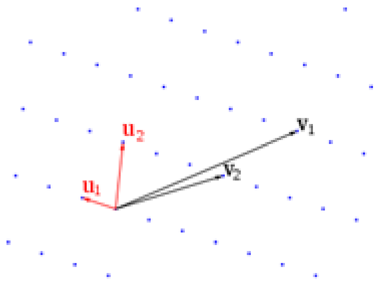
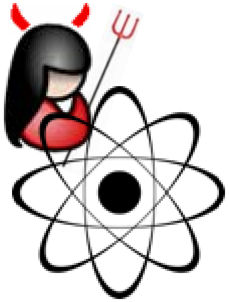
Quantum-Resistant Primitives



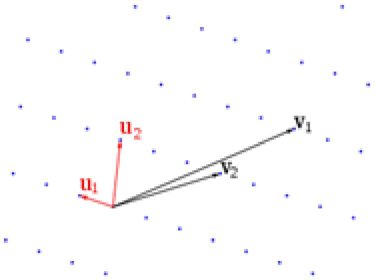
Quantum-Resistant Primitives



quantum-resistant
primitive/protocol

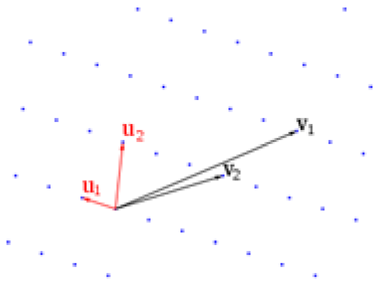


Quantum-Resistant Primitives



quantum-resistant
primitive/protocol

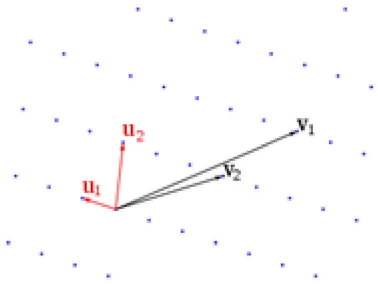
▶ Quantum-Resistant Primitives…with ROs?



quantum-resistant
primitive/protocol

random oracle

Quantum-Resistant Primitives…with ROs?



quantum-resistant
primitive/protocol

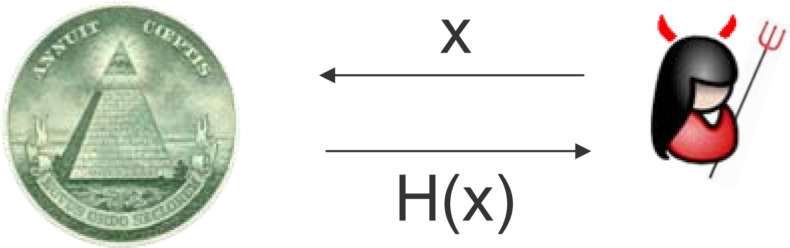
+

random oracle

=

???

▶ Quantum-Accessible Random Oracles

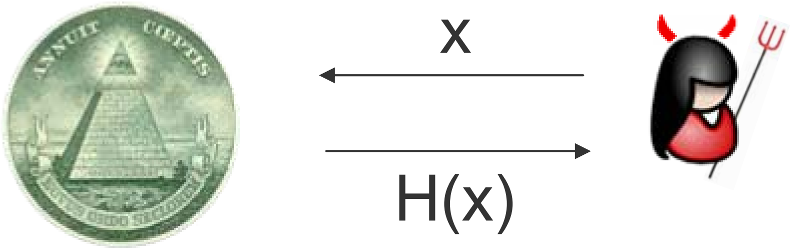


later replace Random Oracle by “strong implementation”

classical

quantum

Quantum-Accessible Random Oracles



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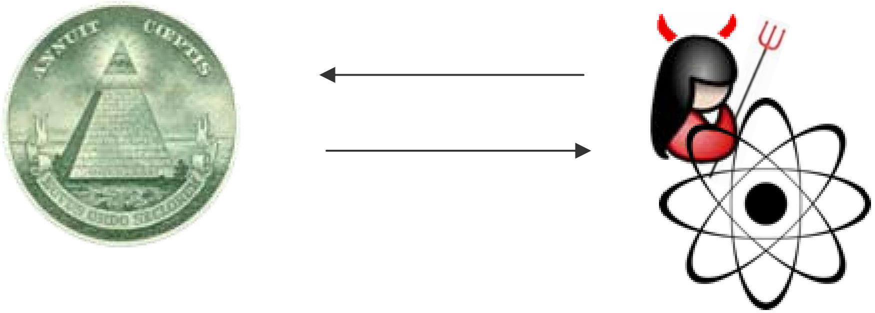
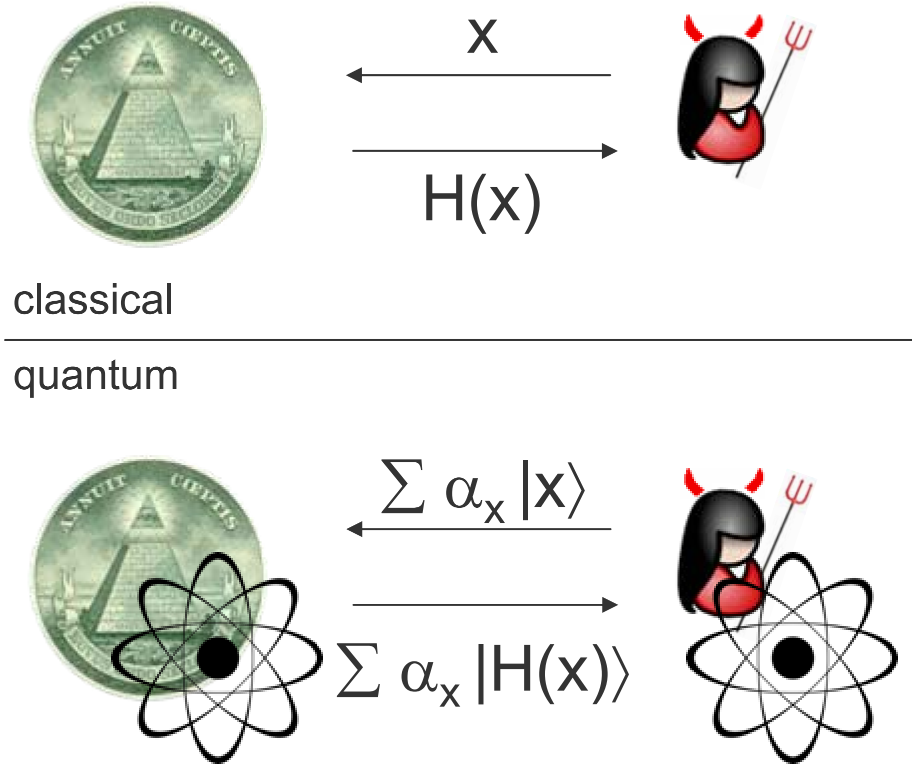


<span>minimal</span> requirement: quantum-adversary may query RO about quantum states

▶ Quantum-Accessible Random Oracles



x

H(x)

classical

quantum

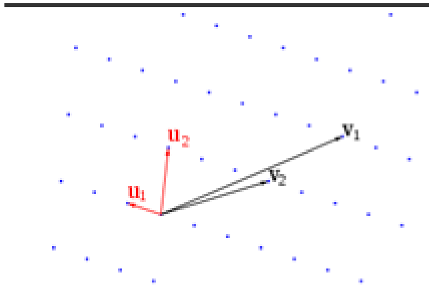
$\sum \alpha_x |x\rangle$

$\sum \alpha_x |H(x)\rangle$

later replace Random Oracle by “strong implementation”

minimal requirement: quantum-adversary may query RO about quantum states

Do Results Carry over?



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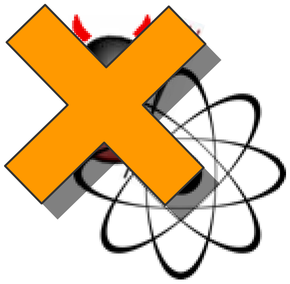
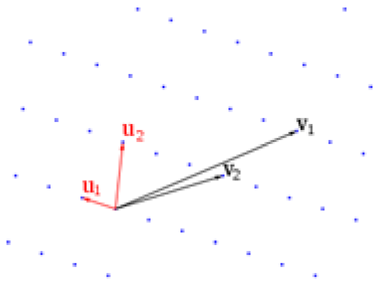
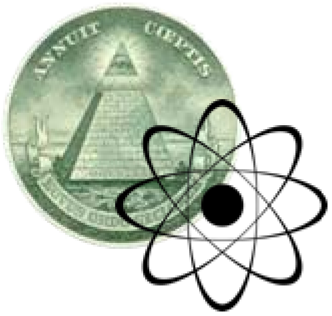


vs



+



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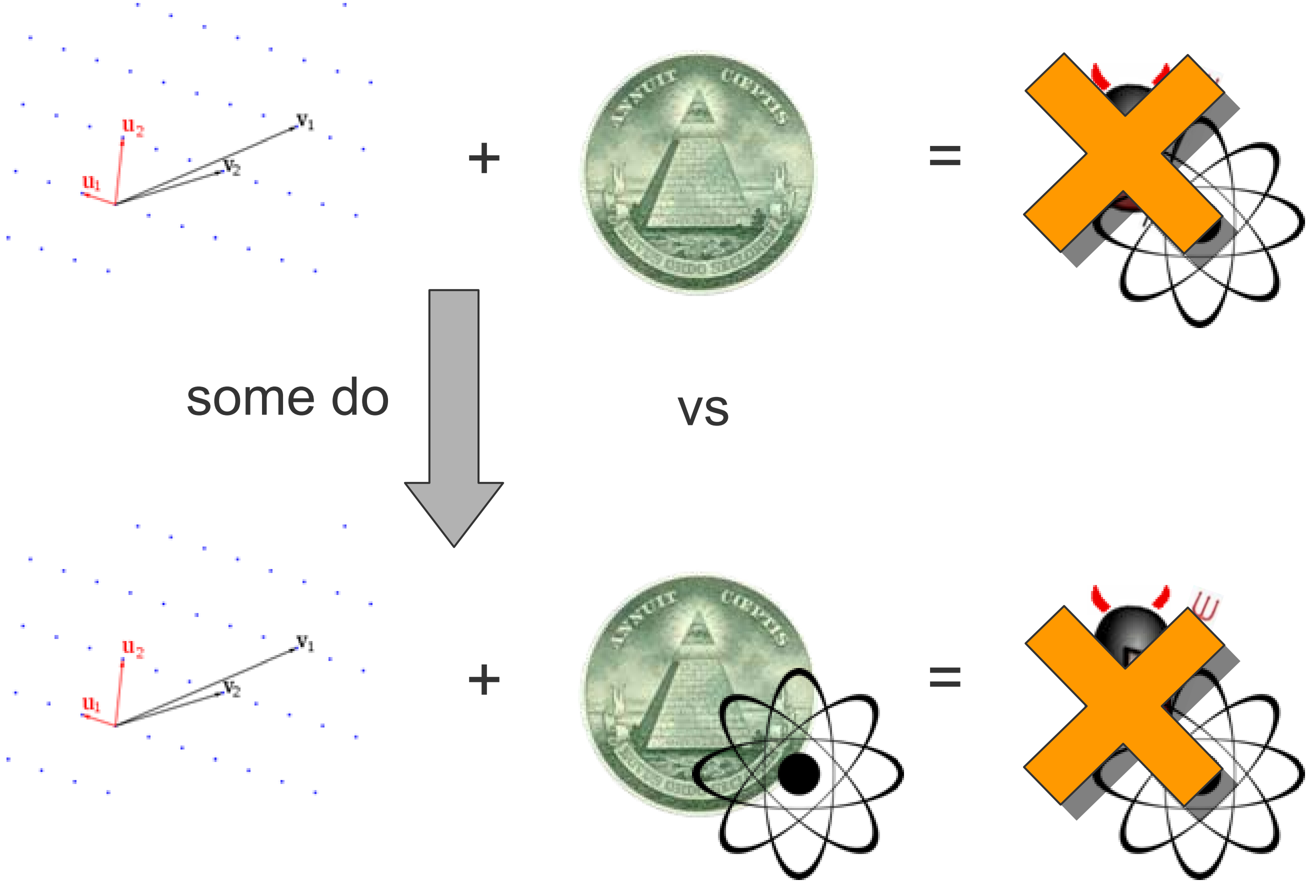


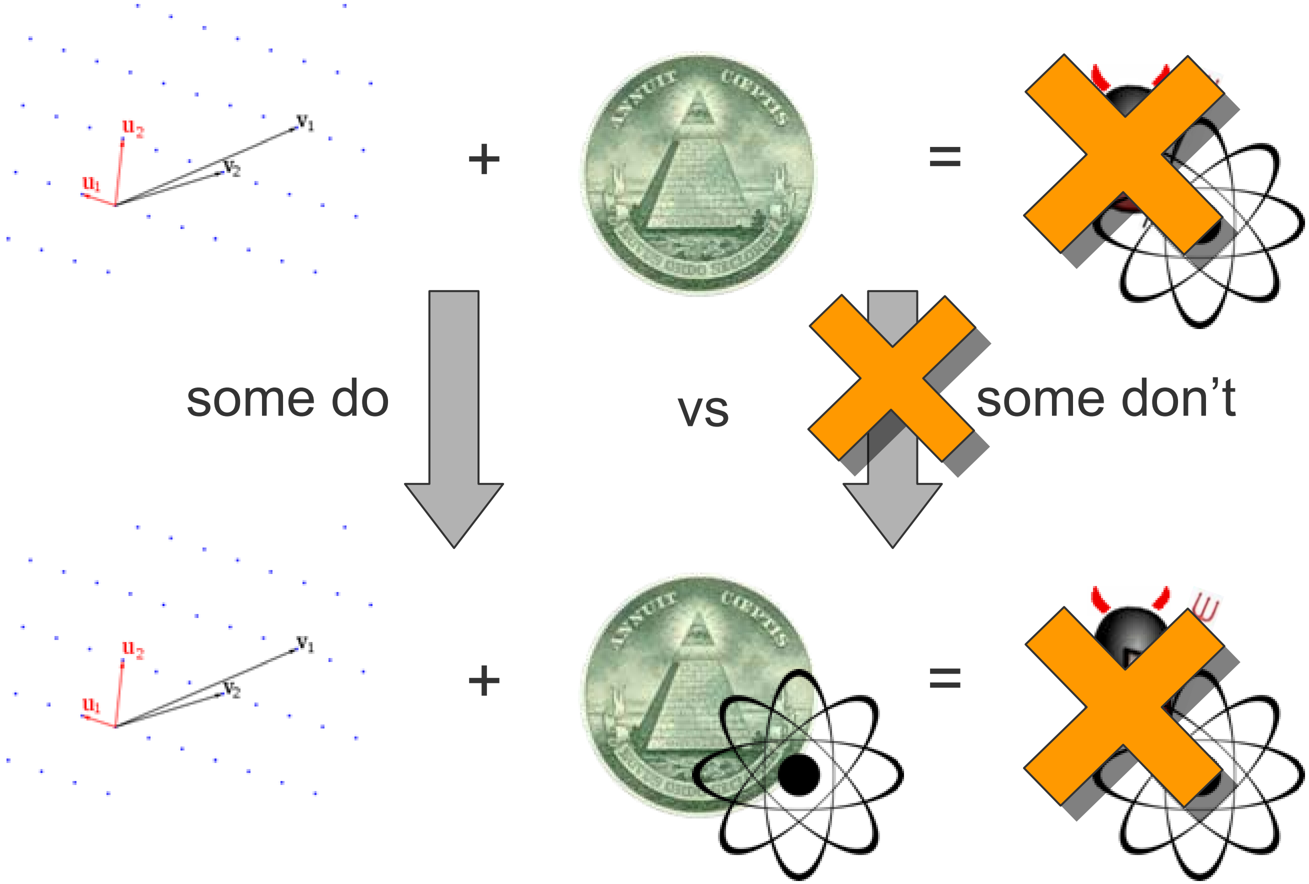
+ =

some do

vs

+ =

Do Results Carry over?



+ =

some do

vs

some don't

+ =

▶ What if I want to know more?

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