

Time-Optimal Information Exchange on Multiple Channels



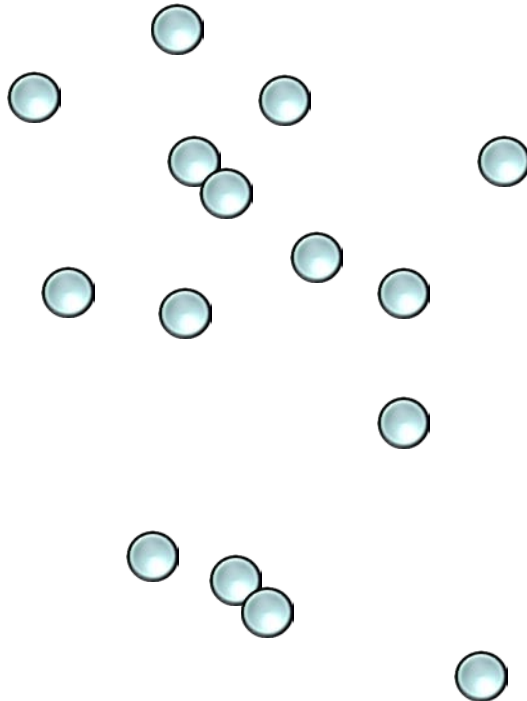
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Yvonne Anne Pignolet
Jasmin Smula
Roger Wattenhofer*

Time-Optimal Information Exchange on Multiple Channels



$n := \# \text{ nodes}$

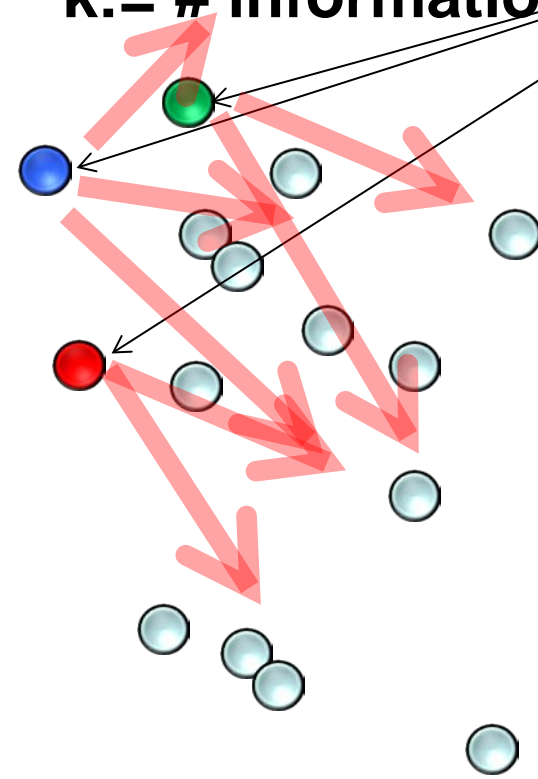
Problem:



Time-Optimal Information Exchange on Multiple Channels



Problem: $n := \# \text{ nodes}$
 $k := \# \text{ information}$ Have information

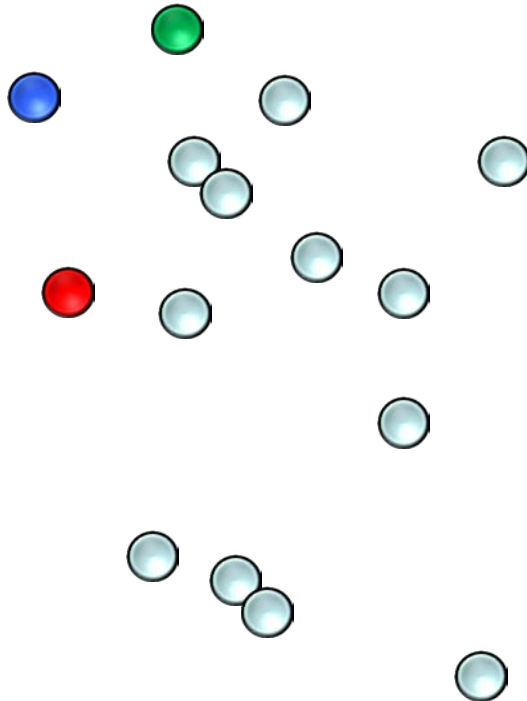



Disseminate to all! ?

Time-Optimal Information Exchange on Multiple Channels



Problem:

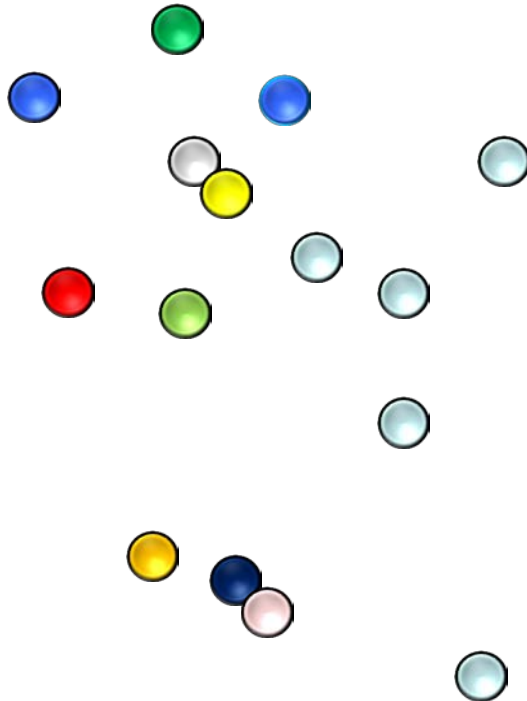


Disseminate to all! 

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Problem:



Disseminate to all! ?

Easy: $O(n)$

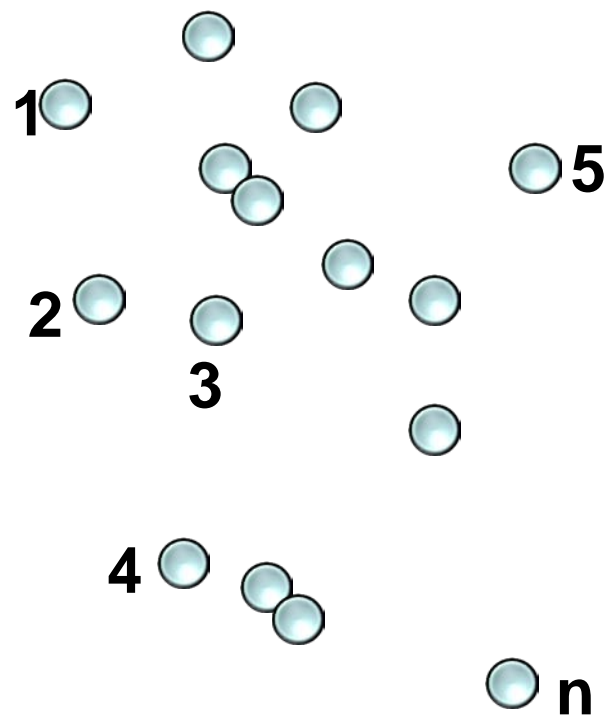
Faster?

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$n := \# \text{ nodes}$

Problem:



Unique IDs 1...n

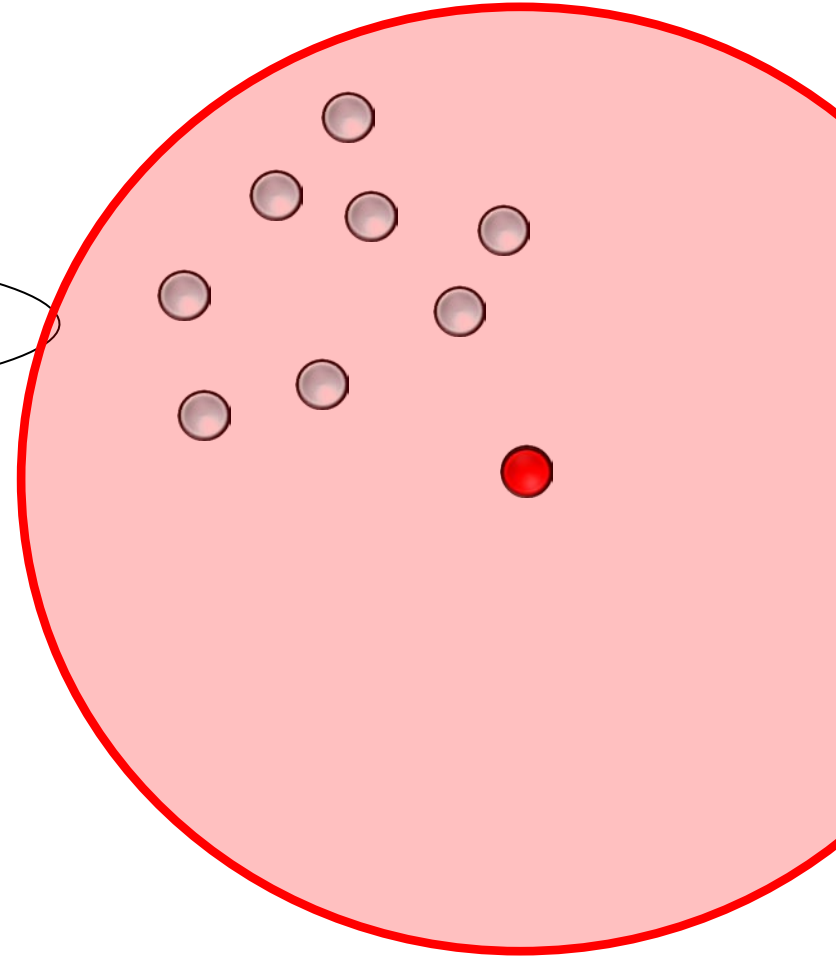
Time-Optimal Information Exchange Channels



I can:

send / receive

reach each node



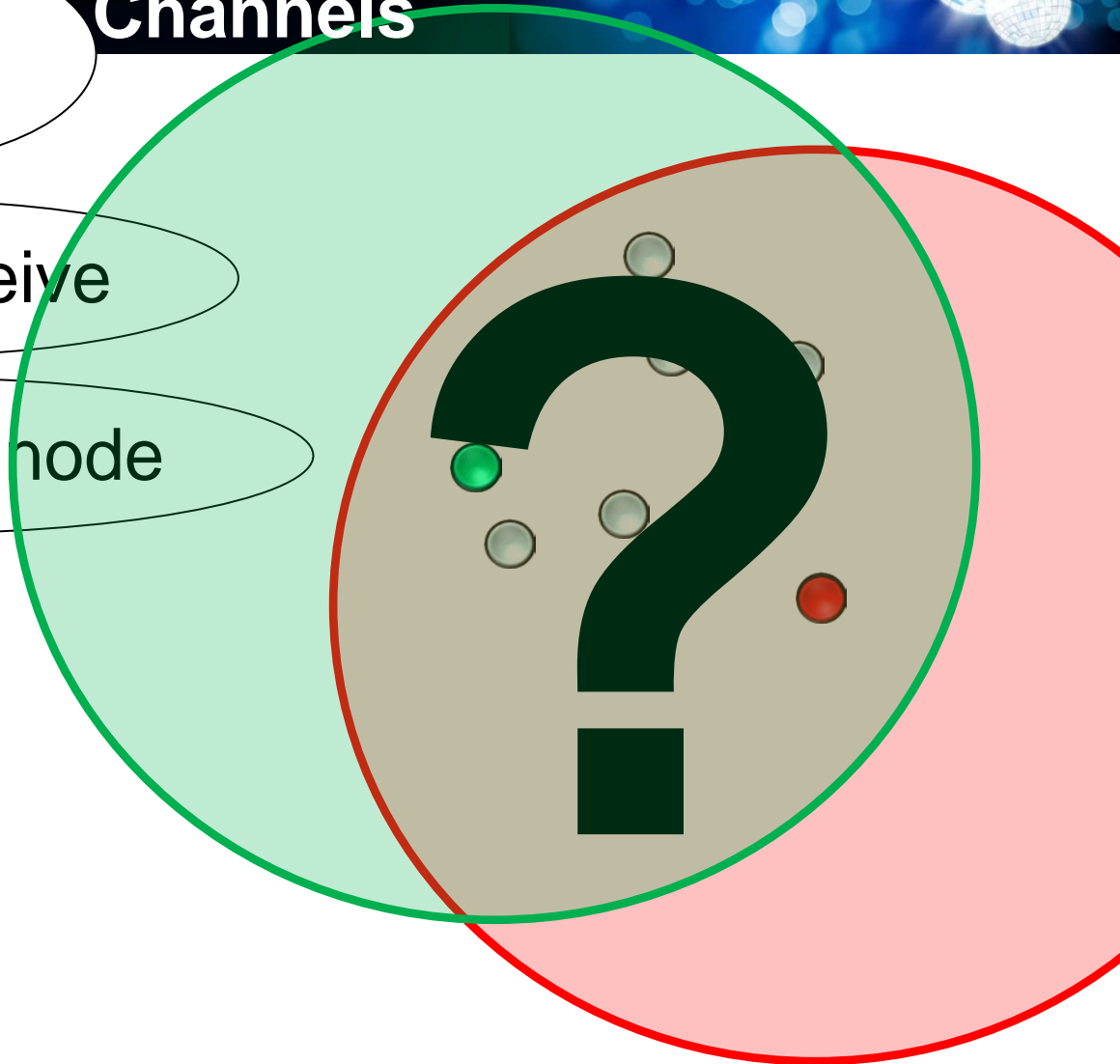
Time-Optimal Information Exchange Channels



I can:

send / receive

reach each node



Time-Optimal Information Exchange Channels

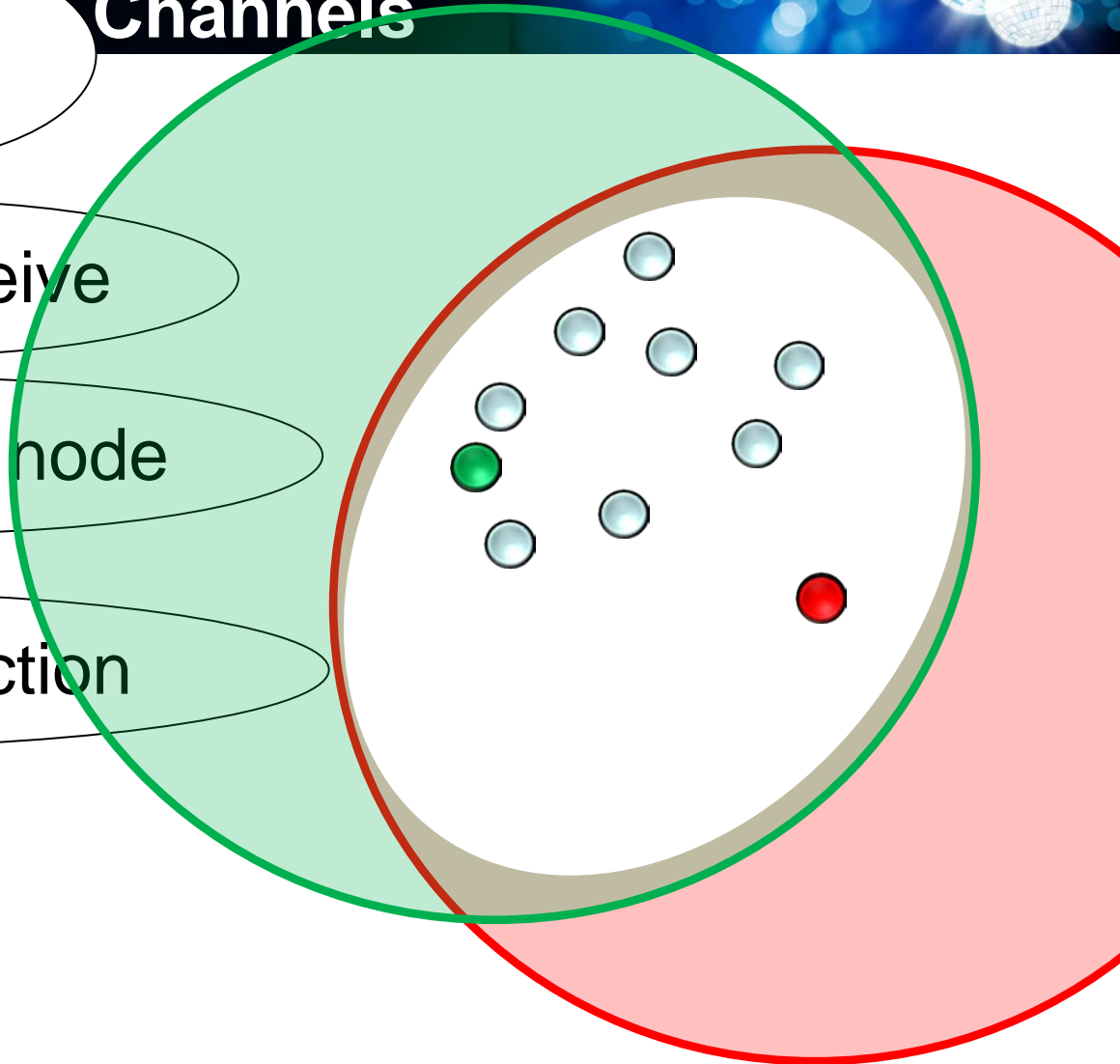


I can:

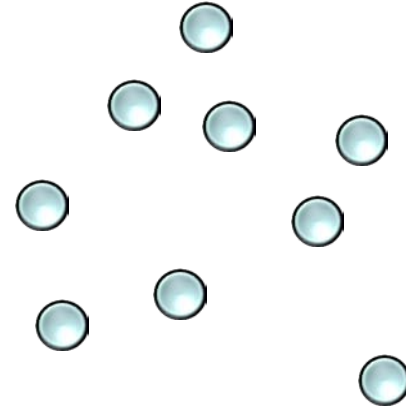
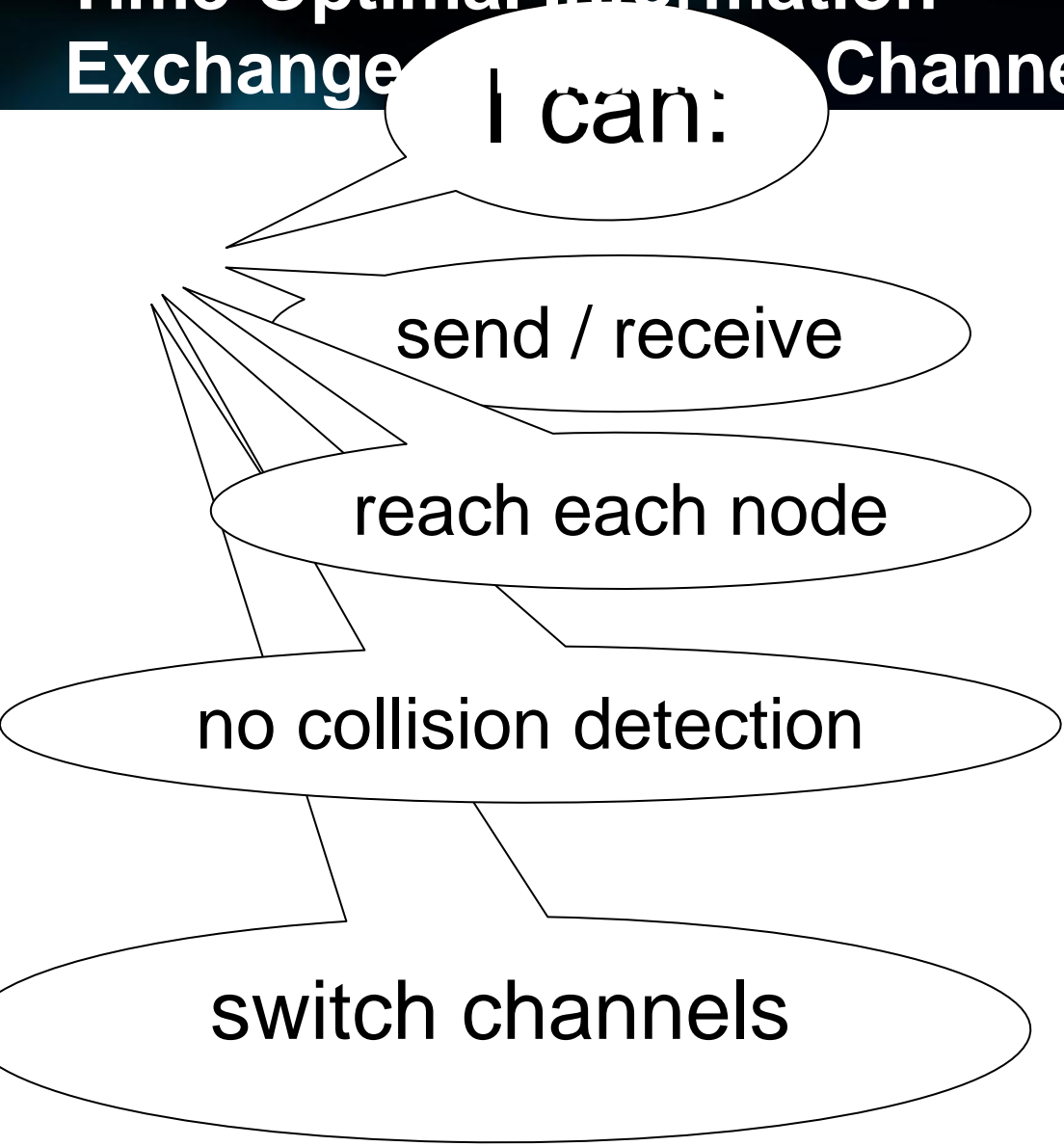
send / receive

reach each node

no collision detection



Time-Optimal Information Exchange Channels



101 Mhz
117 Mhz
132 Mhz

...

Time-Optimal Information Exchange Channels



I can:

send / receive

reach each node

no collision detection

switch channels

complexity
computation: free
radio: time 1

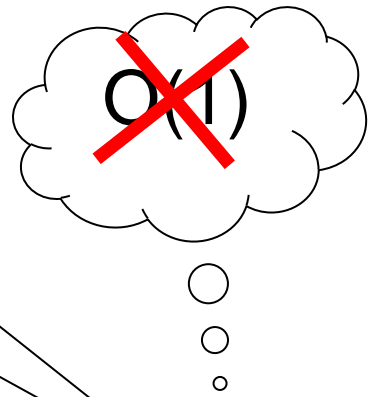
Time-Optimal Information Exchange on Multiple Channels



$n := \# \text{ nodes}$

$k := \# \text{ information}$

One Information / $\log n$ bits per message



$$\Rightarrow \Omega(k)$$

Time-Optimal Information Exchange on Multiple Channels



$n := \# \text{ nodes}$

$k := \# \text{ information}$

Multi channel

$$\Theta(k)$$

one channel

$$\Rightarrow \Omega(k + \log n)$$

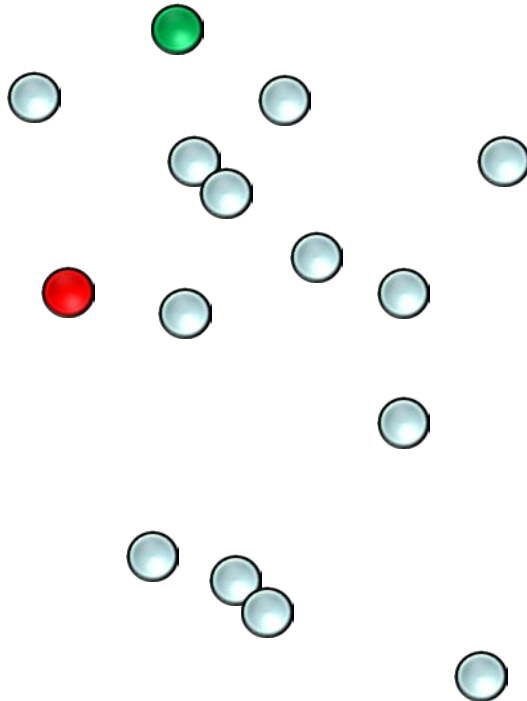
?

[Kushilevitz, Mansour SIAM JComp 1998]

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Problem:



How to find them
In time $O(2)$



Thank You!

Questions & Comments?



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