



Robots Living Amongst Us to create a sociable robot

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Future

- Robots and autonomous agents will increase in number.
- They will serve more roles in human society.

Perceiving human emotion can be one of stimulus in communication between human and robots.

Conclusion

A robot that can express and perceive human emotion

Sociable Robot

Need

- Robots perceive our need.
- We command robots.
- Robots adapt their behavior.

- Robots situated in human world
- Learn by trial and error
- Inventing and mixing up its stock behaviours to response to a new situation

Human emotion has been studied in term of
arts and design



15 (3 pts.) Show that if $a, b,$ and m are integers...

Study... exactly five... each...

(mod 4) (mod 5)

(6 pts.)

Name

15 (3 pts.) Show that if $a, b,$ and m are integers...

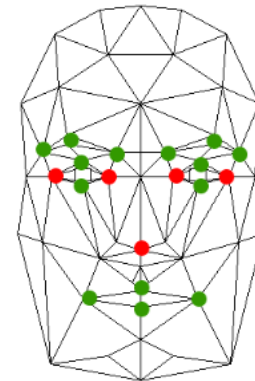
Name

Also

Robot Perception

- N. Auttanugune and T. Horprasert, Head Pose Estimation using Motion Matching. in *15th International Workshop on Advanced Image Technology*, (Ho Chi Minh City, Vietnam, 2012)

Head post estimation



Open-end design achieves with
design by evolution

- Evolutionary Algorithm

Genetic Algorithm

- Create population
- While not terminate
 - Evaluate
 - Selection, recombination, mutation

1998 Synthesis of Synchronous Sequential Logic Circuits from Partial Input/Output Sequences



Two-Horn Chameleon (*Bradypodion fischeri* ssp.) in the Usambara mountains, Tanzania

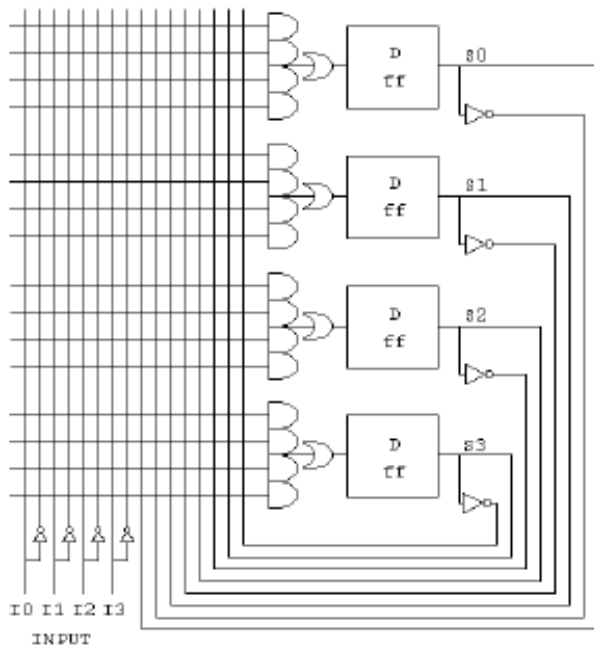


Table 1. Description of circuits in the experiment

Circuit	# of input bits	# of states		lower bound length		upper bound length
		Moore	Mealy	Moore	Mealy	
Frequency Divider	0	8	8	22	22	55
Odd Parity Detector	1	2	2	9	9	163
Modulo-5 Detector	1	6	5	45	35	163
Serial Adder	2	4	2	70	25	451

Note

- Frequency Divider give square wave outputs of clock's frequency divided by 8
- Odd Parity Detector give an output "1" when the number of "1" in inputs is odd
- Modulo-5 Detector give an output "1" when the current input is the $5n^{\text{th}}$ "1"; $n \in \mathbb{I}^+$
- Serial Adder give the sum of 2 inputs, inputs are feeding from LSB to MSB

- Human in the evolution loop

Evolution + Emotion Perception
= Sociable Robot

Team Work



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