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UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION
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SMR/643 - 9

**SECOND COLLEGE ON
MICROPROCESSOR-BASED REAL-TIME CONTROL -
PRINCIPLES AND APPLICATIONS IN PHYSICS
5 - 30 October 1992**

INTRODUCTION TO PROJECTS

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INTRODUCTION TO PROJECTS.

Objectives of the Projects:

TO BE ABLE TO USE AND DEMONSTRATE THE REAL TIME PROGRAMMING CONCEPTS.

Some Preliminaries:

- start on Thursday (roughly 7 days to complete)
- individually or in groups
- outline of projects
- some have been tried out earlier
- improvements are possible, subject to limitations in time, h/w etc.
- Return your 1st and 2nd choice by Tuesday, October 20, 1992.

Already covered:

* ROSY and 6809
* OS9
* C Programming
* ICTP Board.
* MULTI Board.

3 TYPES OF PROJECTS :

1. ROSY only
2. ROSY + ICTP Board.
3. ROSY + ICTP + MULTI Board.

PROJECT PROPOSALS:

TYPE 1 :

1. NETWORKING ROSYs - C Kavka, A M Suarez, A Indurunkf

TYPE 2:

1. QUEUEING THEORY SIMULATOR - CS Ang.
2. CAR PARK SIMULATOR - R Verkeyk
3. REACTION TIMER - R Kaynard, Z R Gao

TYPE 3:

1. SIMULATION OF PROCESS CONTROL SYSTEMS.
   a. CLOSED LOOP CONTROL OF INDEPENDENT PHYSICAL SYSTEMS
      - J Wetherill
      - G F Wu
      - I Ahmed.
   b. INTELLIGENT NiCd CHARGER
      - M P U Bandara

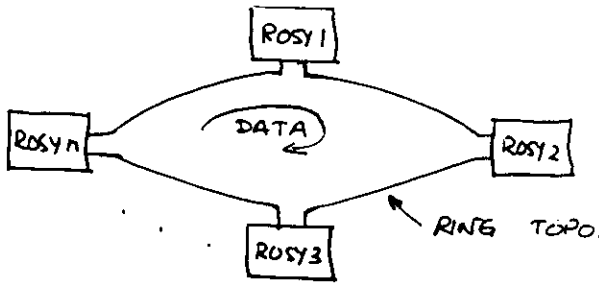
ANY REALISTIC PROPOSALS FROM PARTICIPANTS ARE WELCOME !!

PROJECT : NETWORKING ROSYs.

OBJECTIVES : * TO IMPLEMENT A NETWORK USING ROSY STATIONS
* RUNNING A SIMPLE PROTOCOL
* PROVIDE SERVICES
  - NDIR
  - NCOPY
  - etc

USING FILE TRANSFER.

DESCRIPTION:



STATION TO STATION TRANSFER OF DATA IS ONLY IN ONE DIRECTION EXCEPT FOR THE LOCAL ACKNOLEDGEME BETWEEN TWO ADJACENT STATIONS.

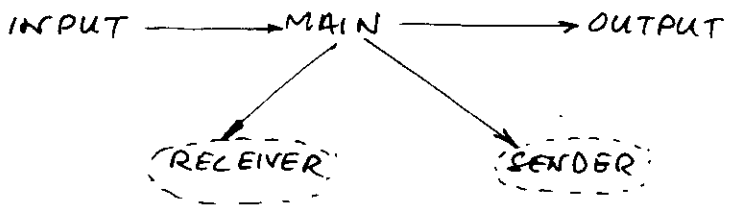
PACKET FORMAT:

DEST	ORIG	SEQ#	DATA + PADDING	CRC

FIXED SIZE FOR SIMPLICITY

PROCESSES:

IN EACH ROSY STATION THE FOLLOWING PROCESSES ARE PRESENT.



THESE PROCESSES ARE WOKEN UP BY CERTAIN EVENTS AND WILL GO TO SLEEP AFTER CARRYING OUT A TASK.

INPUT PROCESS:

RECEIVES PACKETS FROM THE INPUT PORT. A SIGNAL IS SENT TO THE MAIN PROCESS.

MAIN PROCESS:

TAKES ACTION ACCORDING TO THE INFORMATION CONTAINED IN THE RECEIVED PACKET.

OUTPUT PROCESS:

SENDS PACKETS TO THE NEXT STATION THROUGH THE OUTPUT PORT.

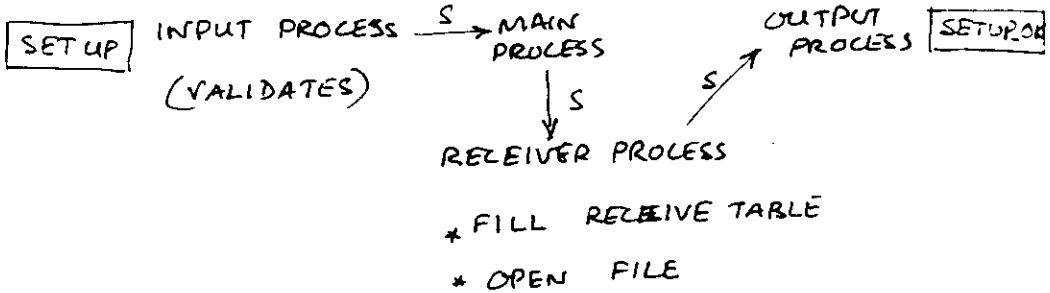
SENDER: LOADED ONLY WHEN A FILE HAS TO BE SENT.

RECEIVER: CALLED ONLY WHEN A SETUP

THE FOLLOWING SITUATIONS HAVE TO BE HANDLED:

* RECEIVED PACKET ADDRESSED TO ANOTHER MACHINE (BRIDGE)
* SETUP (CALL RQST) PACKET RECEIVED
* SETUP-OK PACKET RECEIVED
* DATA PACKET RECEIVED
* DATA_OK PACKET RECEIVED.

Ex: SETUP PACKET RECEIVED:



PROBLEMS:

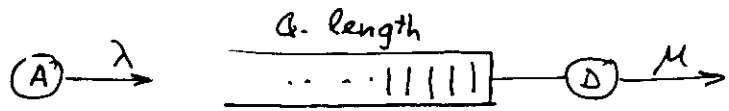
* lost packets
* lost acknowledgements
* duplicated packets, etc.

Use of sequence # and timeouts.

PROJECT : QUEUEING THEORY SIMULATOR

OBJECTIVE : IMPLEMENT A MARKOV INPUT/OUTPUT SYSTEM WITH ONE SERVER. (M/M/1)

DESCRIPTION:

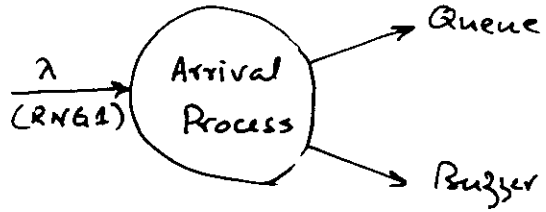


Random (Markov) Arrival
λ- arrival rate

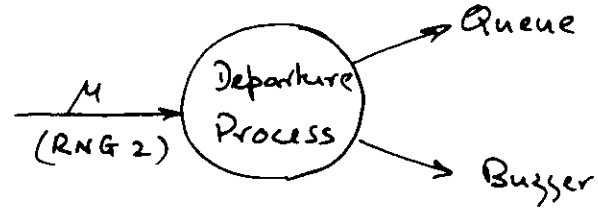
Random (Markov) Departure
μ- departure rate.

PROCESSES:

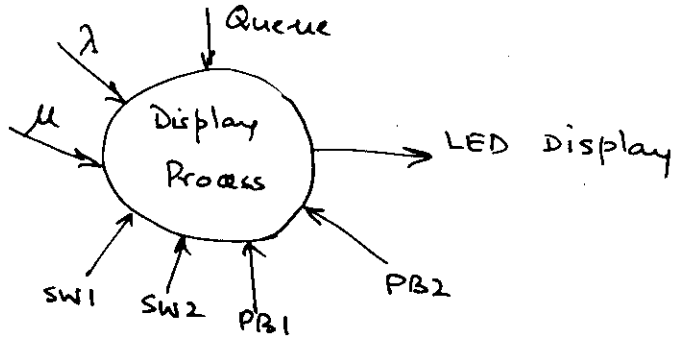
* ARRIVAL PROCESS:



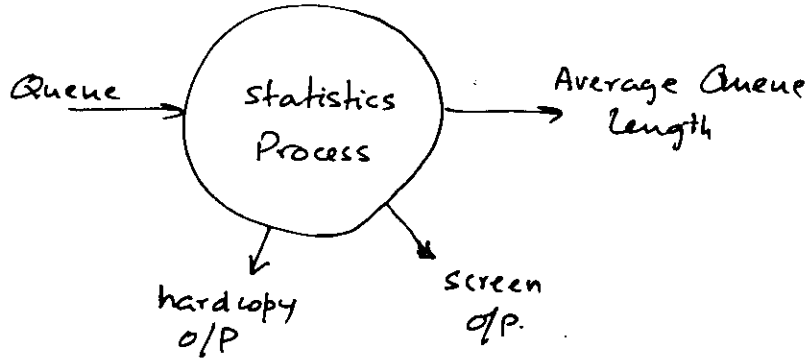
* DEPARTURE PROCESS:



* DISPLAY PROCESS:



* STATISTICS PROCESS:



PROJECT : SIMULATION OF A CAR PARK

PROBLEM:

* CAR PARK HAS A LIMITED NUMBER OF PLACES.
* CARS ARRIVING AT THE GATE & LEAVING CAN BE SIMULATED USING PUSH BUTTONS.
* WHEN THE PARK IS FULL CARS MAY QUEUE UP AT THE ENTRANCE GATE.

OBJECTIVES:

* DISPLAY
  1. NO OF CARS IN THE PARK
  2. NO OF CARS IN THE QUEUE

  ON THE ICTP BOARD SIDE BY SIDE AS TWO DIGIT NUMBERS.
* EXTEND THE MODEL TO A THREE GATE CAR PARK.

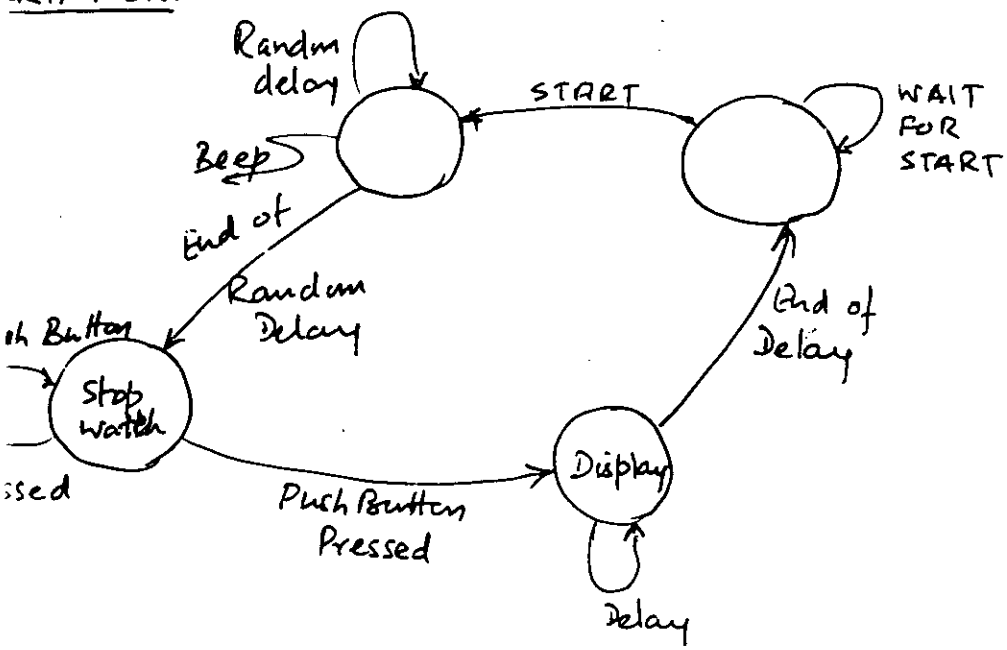
EXPECTED SOLUTION:

* The entrance and exit gates should be assinged to two different tasks.
* A Data module can keep the common variables (count, queue) and semaphor
* Interrupts must be handled in the regular OS9 way.

The necessary device drivers and device descriptors will be provided.

The problem must be solved without the use of the semaphores to demonstrate the mutual exclusion problem. Then the semaphores should be added.

:RIPTION:



OCESSES:

* Random Delay and Beep.
* Stop Watch
* Display the time to react.

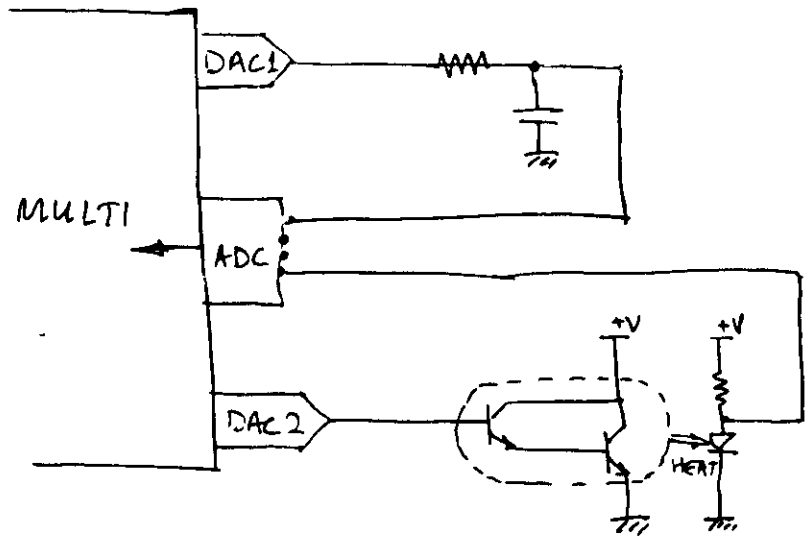
PROJECT: SIMULATION OF PROCESS CONTROL SYSTEMS.

OBJECTIVE: TO CONTROL SEVERAL INDEPENDENT PHYSICAL SYSTEMS.

DESCRITION:

Independent systems can be for example:

* voltage control.
* temperature control.



PROCESSES:

* The control voltage in each case can be monitored by a single module that allows access to its data area by other modules.

* Control algorithm for maintaining information regarding set point error may be another process.

* A third process would display the information on the screen.

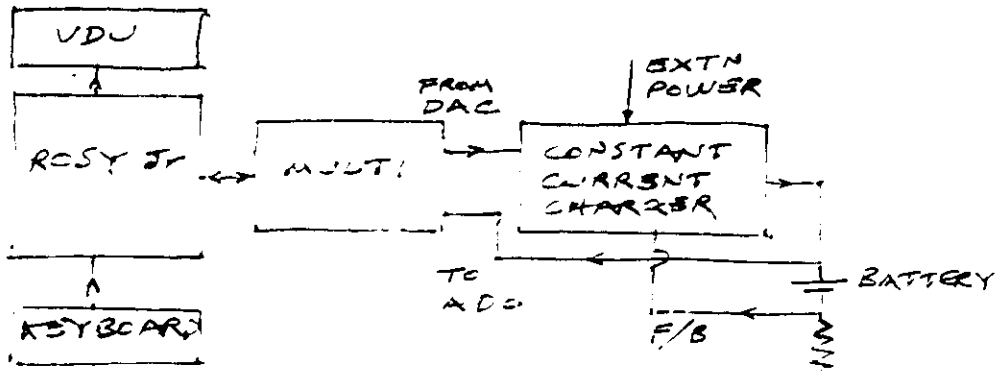
* A fourth process can allow for the control of both systems through the keyboard.

PROJECT : INTELLIGENT Ni-Cd CHARGER

OBJECTIVE : TO REALISE A VERSATILE BATTERY CHARGER USING MULTI-FUNCTION BOARD & ROSY Jr.

DESCRIPTION : A CONSTANT-CURRENT TYPE CHARGER CAN BE CONTROLLED BY USING A DAC OUTPUT FROM THE MULTI-FUNCTION BOARD. THE CHARGING PROCESS CAN BE MONITORED THRO' MULTI's ADC. A NUMBER OF INTERESTING FEATURES SUCH AS AMOUNT OF CHARGE CONTROL, MONITORING CHARGING PROGRESS DECIDING BATTERY CONDITION CAN BE IMPLEMENTED BY SOFTWARE CONTROL.

SEVERAL INDEPENDENT ROUTINES COULD BE WRITTEN TO CARRY OUT THE ABOVE FUNCTIONS AS WELL AS INPUT/OUTPUT AS NECESSARY



PROCESSES

CHARGER CONTROL : AFTER DETERMINING PARTICULARS OF BATTERY, THIS ROUTINE OUTPUTS THE REQUIRED SIGNALS TO THE DAC OF MULTI.

CHARGE MONITORING : ONCE BATTERY IS PUT UNDER CHARGING, THIS ROUTINE MONITORS CHARGING TIME, AS WELL AS BATTERY VOLTAGE AND DECIDES WHEN TO STOP CHARGING.

INPUT/OUTPUT ; THESE ROUTINES WILL ENABLE DETAILS OF THE BATTERY TO BE OBTAINED BEFORE CHARGING COMMENCES. ALSO TO OUTPUT INFO. ON PROGRESS OF CHARGING.