

Chapter 11

Real Time Operating System

Lesson 08

**Exemplary Use of RTOS in System
Design—Case Study of Toffee
Vending Machine ITMS of RTOS
51 in Design**

Four Tasks `taskdsply`, `taskkeyparsing`, `taskmoney` and `tasktoffee`

- `os_create_task` function for creating next task before the while loop in tasks 0, 1, and 2 in BWMS
- So, creation is only once (tasks are readied once here).
- ITMS example, we have a task named task *Start Application* and that creates four tasks

Four Tasks

- In the never ending while–loop
- Task *start_Application* deletes itself at the loop last statement
- After this, the four tasks will only be one in the control of RTOS

Use RTOS functions for system design of ITMS

- Four tasks for preemptive scheduled by a version, *RTX51 Full*

Example 2: Automatic Toffee Vending Machine

- Two tasks— one collecting coin and other delivering the toffee
- Task1 sends signal to a task 2 for toffee delivery after collecting the coin(s)

Automatic Toffee Vending Machine

task key-
parsing

priority 0

Task
Money-
collect

priority 1

Task Toffee
delivery

priority 2

Task
Display

priority 3

Preprocessor and main function statements

```
. #include <rtxt51full.h>
```

```
.
```

```
.
```

```
2. void main ( ) { while (1)  
{ os_start ( ); }  
}
```


`_task_start_Application` create tasks 0 and 1

- `_task_start_Application` {
- `os_create_task (task 0, priority 0); /* task 0 ready and assign priority = 0*/`
- `os_create_task (task 1, priority 1); /* task 1 ready and assign priority = 1*/`

`_task_start_Application` create tasks 2 and 3

- `_os_create_task (task 2, priority 2); /* task 2 ready and assign priority = 2*/`
- `os_create_task (task 3, priority 3); /* task 3 ready and assign priority = 3*/`

`_task_start_Application` while loop and deleting itself

- `while (1) {os_delete_task (start_Application);
/* task start_Application deleted and RTOS
does not take notice of it for ever*/`
- `}`
- `};`

`__task_0`

```
task_0 {  
while (1) {  
/* Code for task key parsing */  
  
.  
if (select_key) os_send_message (menu, task 3, 0);  
if (upkey || downkey) os_send_message (user_Msg, task  
    3, 0);  
if (enter_key) {os_send_message (slectionMsg, task 2,  
    0); os_send_signal (task1); }  
if (upkey || downkey) os_send_message (user_Msg, task  
    3, 0);  
}
```

task_0 delay so that lower priority task
1 starts

```
os_wait (K_TMO, task 3, 0);  
};  
};
```

`_task_1`

```
_task_1 {  
while (1) {  
/* Code for task money*/  
coin_collect ();  
if (collect_Money_OK) {os_send_message  
    (Thanks_MSG, task3, 0); os_send_token (s1);  
    }  
}
```

task_1 delay so that lower priority task
2 starts

```
os_wait (K_TMO, task 3, 0);  
}  
}
```

`_task_2` wait for message and semaphore

- `_task_2` {
- `while (1) {`
- `/* Code for task toffee delivery */`
- `.`
- `os_wait_message (slectionMSG);`
- `os_wait_token (s1);`

task_2 delay so that lower priority task 3 starts

- `os_wait (K_TMO, task 3, 0);`
- `.`
- `}`
- `}`

`_task_3 mailbox check`

- `_task_3 {`
- `while (1) {`
- `/* Code for task for display machine idle state message, menu and cursor as customer user message and thanks message on coin insertion */`
- `.`
- `.`
- `os_check_mailboxes (); if (Null) {display (Msg_Idle)} /* call function to display idle machine messages */ os_check_token (s_menu); if (not Null) {display (Menu)} /* call function to display toffee Menu with current cursor */`

`_task_3` user message wait

- `os_wait_message (user_Msg); if (not Null)`
`{display (user_Msg)} /* call function to`
`display`
- changed menu position from the customer*/

`_task_3` Thanks message wait

- `os_wait_message (Thanks_Msg); if not Null`
`{display (Thanks_Msg)} /* call function to`
`display thanks message to customer */`
- `.`
- `};`
- `};`

Summary

We learnt

- Toffee Vending Machine System
- Task creation and deletion
- Preemptive scheduling methods - round-robin
- Use of semaphore
- Use of signal
- Use of delay function to enable low priority task start

End of Lesson 08 on

**Exemplary Use of RTOS in System
Design—Case Study of Toffee Vending
Machine of RTOS 51 in Design**