Simulation

EXAMPLES

Example A

Growing vegetables

DETERMINISTIC BUSINESS MODEL

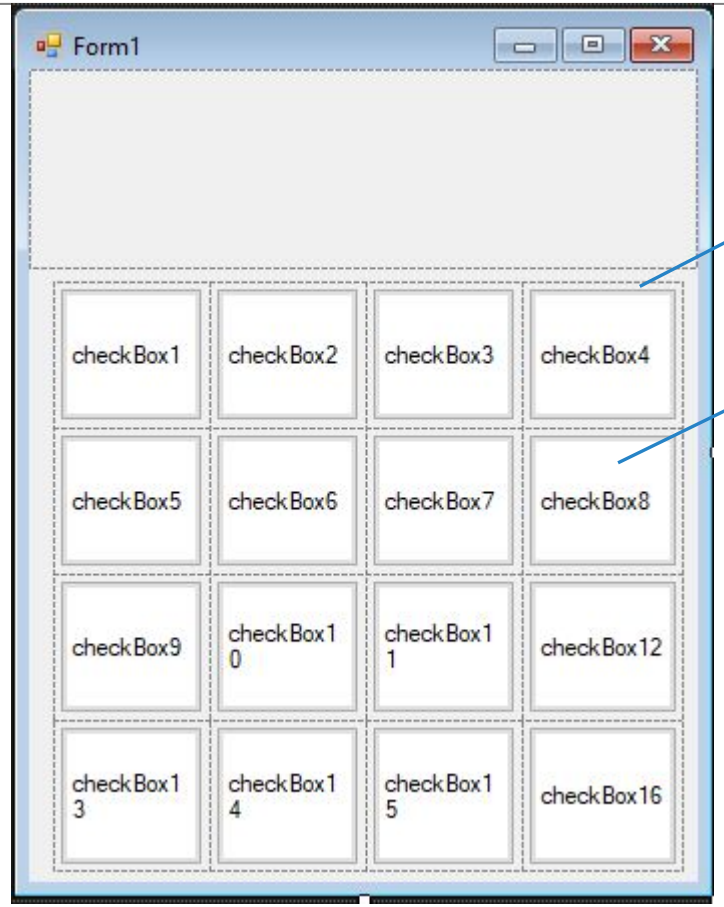
Example A

Business model:

click – start to grow /
cut vegetables

Stages:

- Empty
- Start growing
- Plant shoots
- Nearby mature
- Mature
- Rotten



TableLayoutPanel

CheckBox
Apperiance=Button

Example A

Click on checkbox

```
private void checkBox1_CheckedChanged(object sender, EventArgs e)
{
    CheckBox cb = (sender as CheckBox);
    if (cb.Checked) StartGrow(cb);
    else Cut(cb);
}

private void Cut(CheckBox cb)
{
    cb.BackColor=Color.White;
}

private void StartGrow(CheckBox cb)
{
    cb.BackColor=Color.Black;
}
```

Example A

Adding timer

```
private void timer1_Tick(object sender, EventArgs e)
{
    foreach(CheckBox cb in tableLayoutPanel1.Controls)
    {
        if (cb.BackColor == Color.Black) cb.BackColor = Color.Green;
        else if (cb.BackColor == Color.Green) cb.BackColor = Color.Yellow;
        else if (cb.BackColor == Color.Yellow) cb.BackColor = Color.Red;
        else if (cb.BackColor == Color.Red) cb.BackColor = Color.Brown;
    }
}
```

Example A

Using business model

```
enum CellState
{
    Empty,
    Growing,
    Green,
    Yellow,
    Red,
    Overgrow
}
```

Example A

Cell class

```
class Cell
{
    public CellState state = CellState.Empty;

    public void NextState()
    {
        if ((state != CellState.Overgrow) && (state != CellState.Empty)) state++;
    }

    internal void StartGrow()
    {
        state++;
    }

    internal void Cut()
    {
        state = CellState.Empty;
    }
}
```

Example A

Field

```
public partial class Form1 : Form
{
    Dictionary<CheckBox, Cell> field = new Dictionary<CheckBox, Cell>();
    public Form1()
    {
        InitializeComponent();

        foreach (CheckBox cb in tableLayoutPanel1.Controls)
            field.Add(cb, new Cell());
    }
```

Example A

New methods

```
private void Cut(CheckBox cb)
{
    field[cb].Cut();
    UpdateBox(cb);
}

private void StartGrow(CheckBox cb)
{
    field[cb].StartGrow();
    UpdateBox(cb);
}

private void timer1_Tick(object sender, EventArgs e)
{
    foreach(CheckBox cb in tableLayoutPanel1.Controls)
    {
        field[cb].NextState();
        UpdateBox(cb);
    }
}
```

Example A

New methods

```
private void UpdateBox(CheckBox cb)
{
    Color c = Color.White;
    switch (field[cb].state)
    {
        case CellState.Growing: c = Color.Black;
            break;
        case CellState.Green: c = Color.Green;
            break;
        case CellState.Yellow: c = Color.Yellow;
            break;
        case CellState.Red: c = Color.Red;
            break;
        case CellState.Overgrow: c = Color.Brown;
            break;
    }
    cb.BackColor = c;
}
```

Example A

Time slot

```
private void timer1_Tick(object sender, EventArgs e)
{
    foreach(CheckBox cb in tableLayoutPanel1.Controls)
    {
        field[cb].NextState();
        UpdateBox(cb);
    }
}
```

Step

Example A

Cell class

```
class Cell
{
    internal void StartGrow()
    {
        state++;
    }

    internal void Cut()
    {
        state = CellState.Empty;
        progress = 0;
    }
```

Example A

Cell class

```
internal void Step()
{
    if ((state != CellState.Overgrow) && (state != CellState.Empty))
    {
        progress++;
        if (progress < prGrowing) state = CellState.Growing;
        else if (progress < prGreen) state = CellState.Green;
        else if (progress < prYellow) state = CellState.Yellow;
        else if (progress < prRed) state = CellState.Red;
        else state = CellState.Overgrow;
    }
}

const int prGrowing = 20;
const int prGreen = 60;
const int prYellow = 80;
const int prRed = 100;
```

Example A

Using property (Cell class)

```
public CellState state
{
    get
    {
        if (progress == 0) return CellState.Empty;
        if (progress < prGrowing) return CellState.Growing;
        else if (progress < prGreen) return CellState.Green;
        else if (progress < prYellow) return CellState.Yellow;
        else if (progress < prRed) return CellState.Red;
        else return CellState.Overgrow;
    }
}
private int progress = 0;

internal void StartGrow()
{
    progress++;
}

internal void Cut()
{
    progress = 0;
}

internal void Step()
{
    if ((state != CellState.Overgrow) && (state != CellState.Empty))
        progress++;
}
```

Example A

Showing date (Form1 class)

```
int day = 0;

private void timer1_Tick(object sender, EventArgs e)

{

    foreach(CheckBox cb in tableLayoutPanel1.Controls)

    {

        field[cb].Step();

        UpdateBox(cb);

    }

    day++;

    labDay.Text = "Day: " + day;

}
```

Laboratory #1

ASSIGNMENTS:

- Add economics
- Add speed controls