



UNIVERSITETET I BERGEN

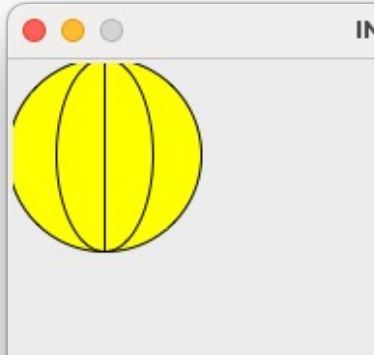
GRAFISKE BRUKERGRENSESNITT

INF100

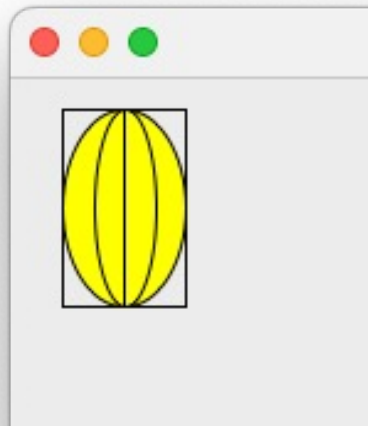
VÅR 2024

Torstein Strømme

FLEKSIBLE TEGNINGER



```
def draw_ball_fixed(canvas):  
    canvas.create_oval(0, 0, 100, 100, fill='yellow')  
    canvas.create_oval(25, 0, 75, 100)  
    canvas.create_line(50, 0, 50, 100)
```

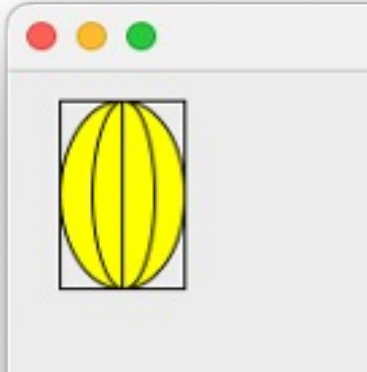


```
def draw_ball_scaled(canvas, width, height):  
    ...
```

```
def draw_ball_shifted(canvas, dx, dy):  
    ...
```

```
def draw_ball_in_box(canvas, x1, y1, x2, y2):  
    ...
```

FLEKSIBLE TEGNINGER



```
def draw_ball_in_box(canvas, x1, y1, x2, y2):  
    std_width = 100  
    std_height = 100  
    width = x2 - x1  
    height = y2 - y1  
    w_factor = width / std_width  
    h_factor = height / std_height
```

```
    canvas.create_oval(  
        0 * w_factor + x1,  
        0 * h_factor + y1,  
        100 * w_factor + x1,  
        100 * h_factor + y1,  
        fill='yellow'  
    )  
    ...
```

samme som før

alle x-verdier

alle y-verdier

EVENT_APP



EVENT_APP

```
from uib_inf100_graphics.event_app import run_app

def app_started(app):
    app.count = 42

def key_pressed(app, event):
    app.count += 1

def redraw_all(app, canvas):
    cx = app.width / 2
    cy = app.height / 2
    canvas.create_text(cx, cy, text=f'{app.count}', font='Arial 60')

run_app(width=500, height=200)
```



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for å starte programmet

EVENT_APP



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    app.count = 42
```



kjøres når programmet starter

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def key_pressed(app, event):  
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*tenk på **app** som en samling med variabler*

EVENT_APP



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```

```
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```

oppretter en ny variabel «count»

EVENT_APP



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```
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```

← kalles (av rammeverket) når lerretet skal tegnes

EVENT_APP



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    app.count += 1
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```
def redraw_all(app, canvas):
```

```
    cx = app.width / 2
```

```
    cy = app.height / 2
```

```
    canvas.create_text(cx, cy, text=f'{app.count}', font='Arial 60')
```

```
run_app(width=500, height=200)
```

tegning gjøres akkurat som før



EVENT_APP



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```

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run_app(width=500, height=200)
```

variabler for width og height finnes i app fra før

EVENT_APP



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variabel vi nettopp opprettet i app_started



EVENT_APP



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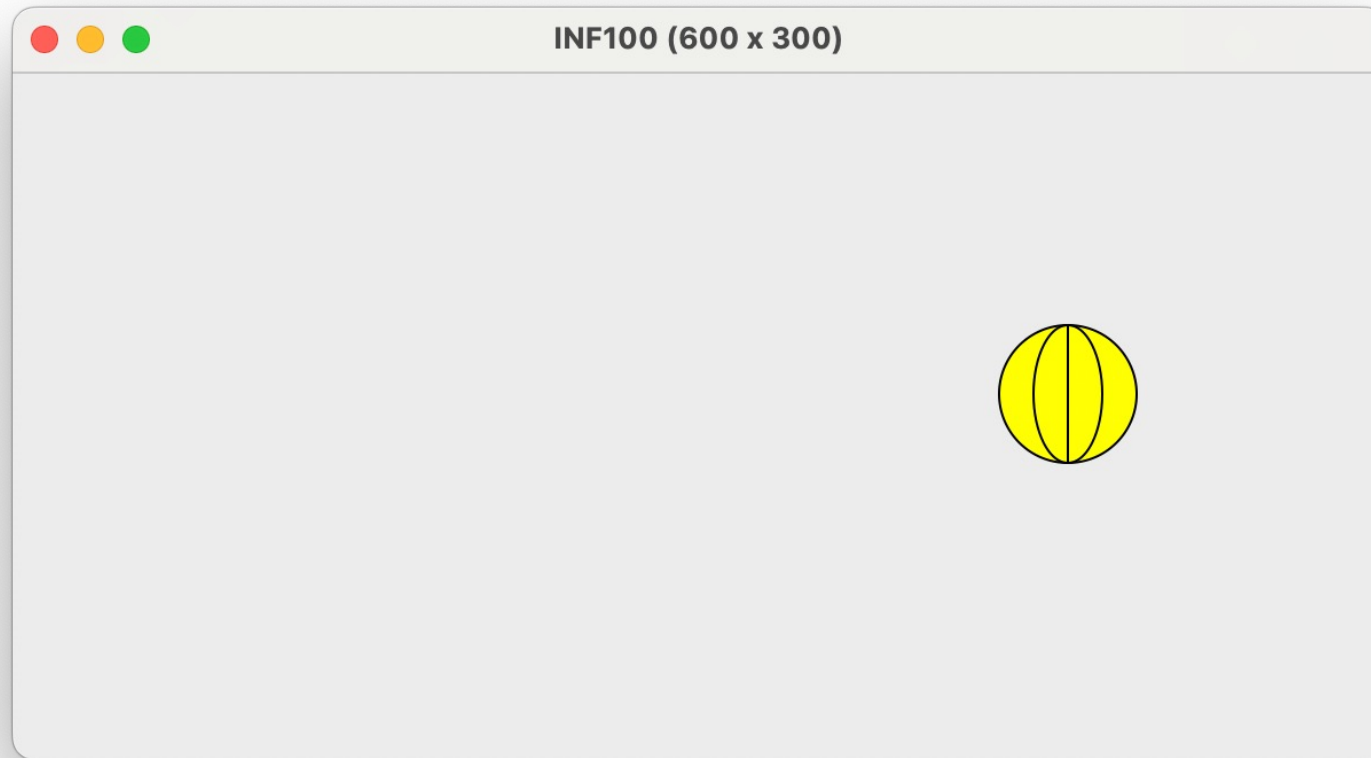
```
def key_pressed(app, event):  
    app.count += 1
```

← *kalles hver gang en tast trykkes*

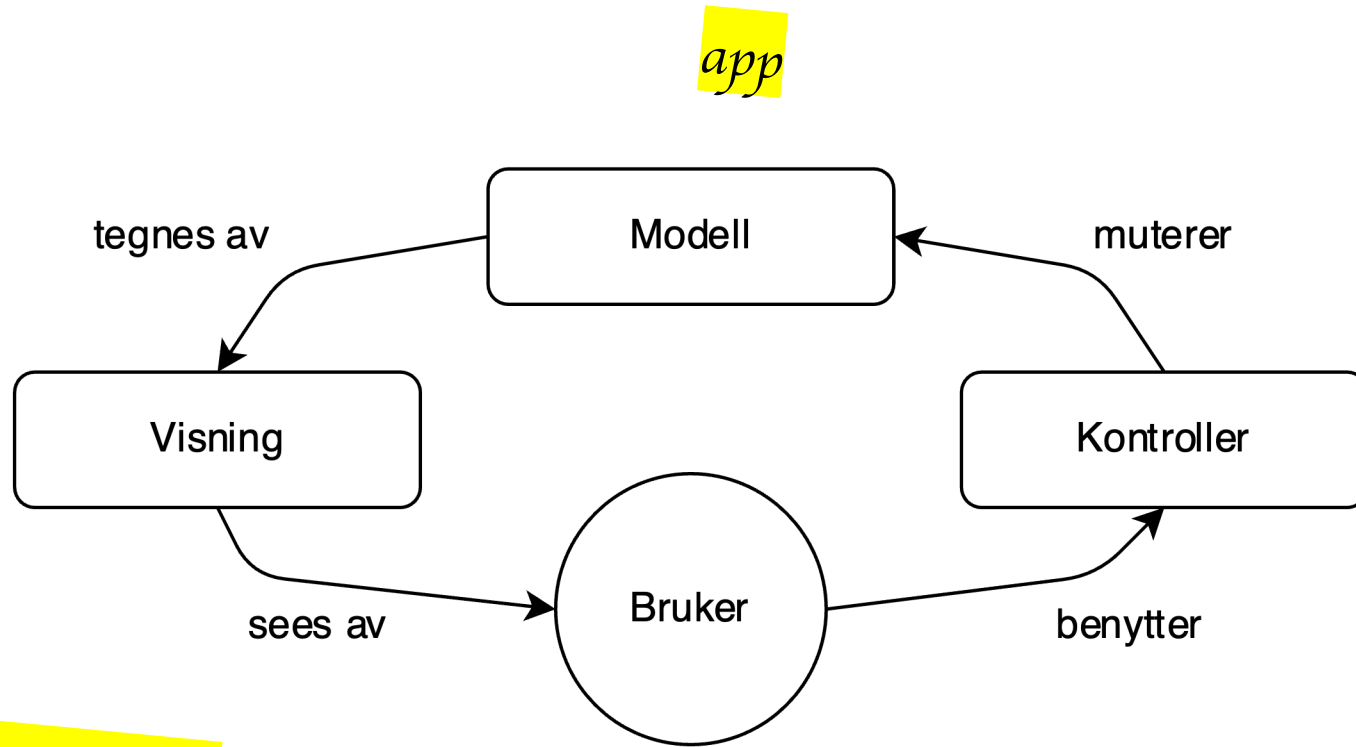
```
def redraw_all(app, canvas):  
    cx = app.width / 2  
    cy = app.height / 2  
    canvas.create_text(cx, cy, text=f'{app.count}', font='Arial 60')
```

```
run_app(width=500, height=200)
```

FLYTT PÅ BALLEN



MODEL VIEW CONTROLLER



app_started(app)
app_stopped(app)

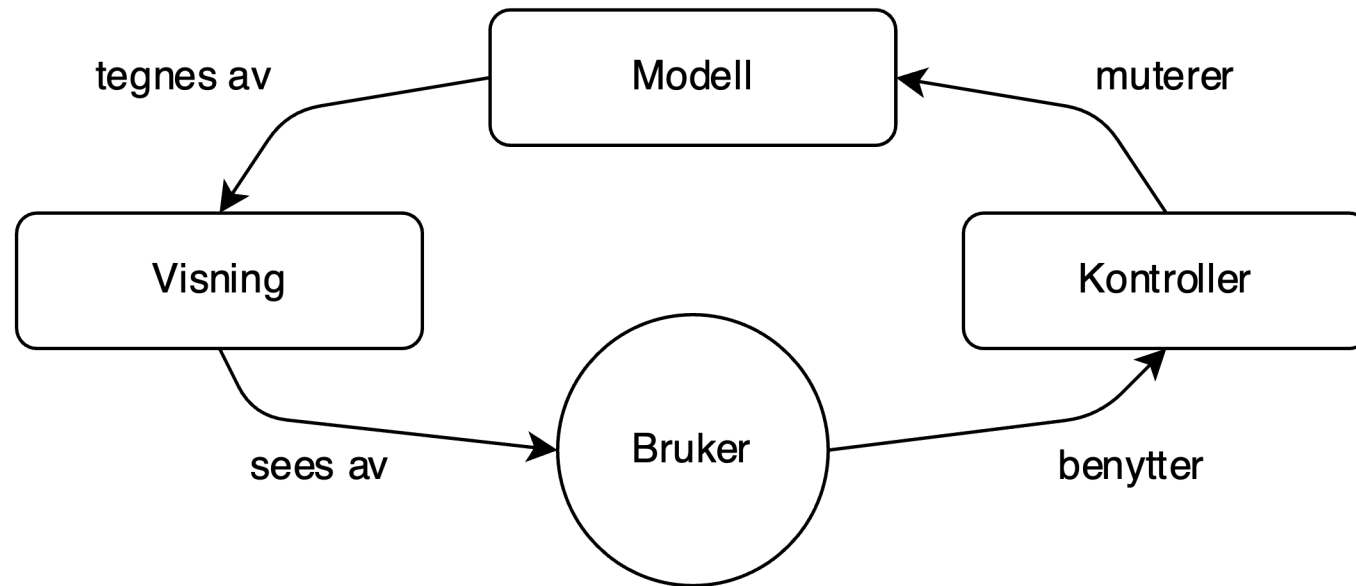
key_pressed(app, event)
key_released(app, event)

mouse_pressed(app, event)
mouse_released(app, event)
mouse_moved(app, event)
mouse_dragged(app, event)

timer_fired(app)

redraw_all(app, canvas)

MODEL VIEW CONTROLLER



Regler

- Ikke lov å mutere modellen i visningen
- Visning og kontroller må ikke kalle hverandre

TEGNEPROGRAM

