GRAFISKE BRUKERGRENSESNITT

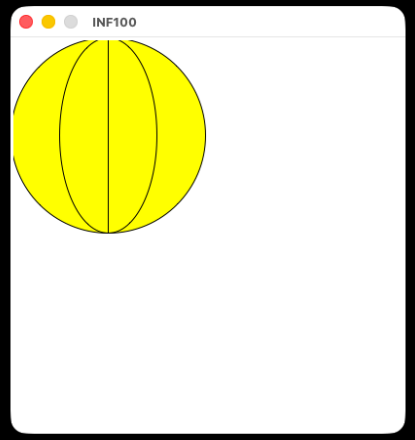
INF100

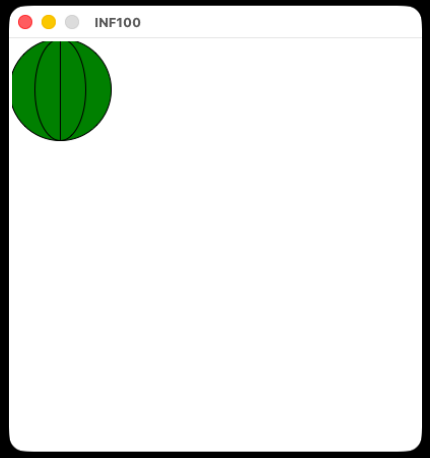
VÅR 2026

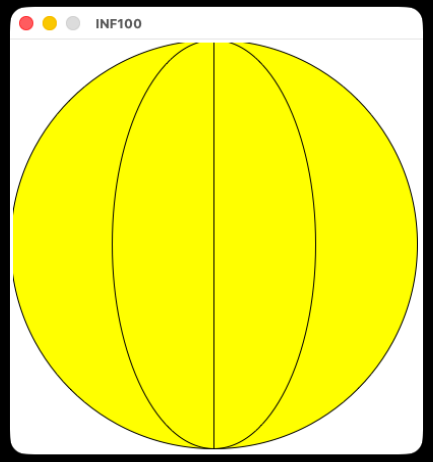
Crystal Chang Din

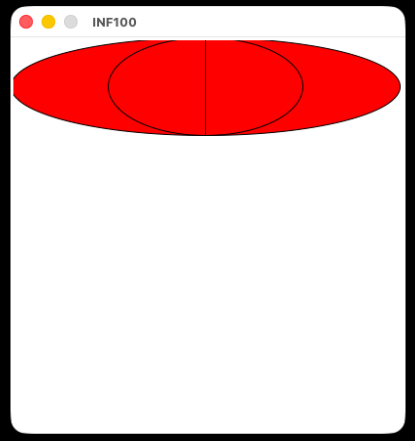
Med bidrag fra: Torstein Strømme

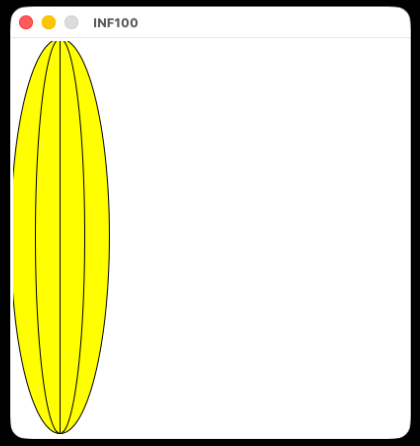
FLEKSIBLE TEGNINGER

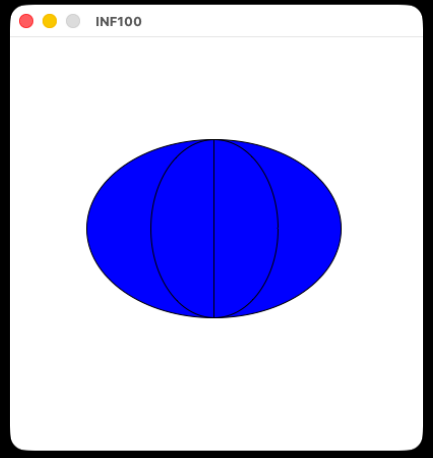




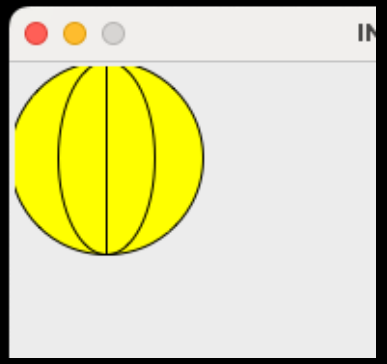




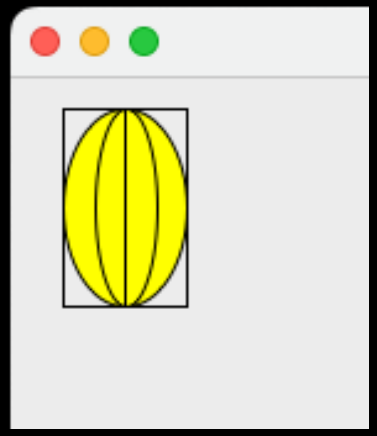




FLEKSIBLE TEGNINGER



```
def draw_ball_fixed(canvas):
    canvas.create_oval(0, 0, 200, 200, fill='yellow')
    canvas.create_oval(20, 0, 150, 200)
    canvas.create_line(100, 0, 100, 200)
```

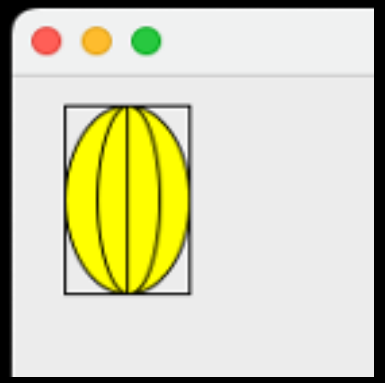


```
def draw_ball_scaled(canvas, width, height):
    ...

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

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

FLEKSIBLE TEGNINGER



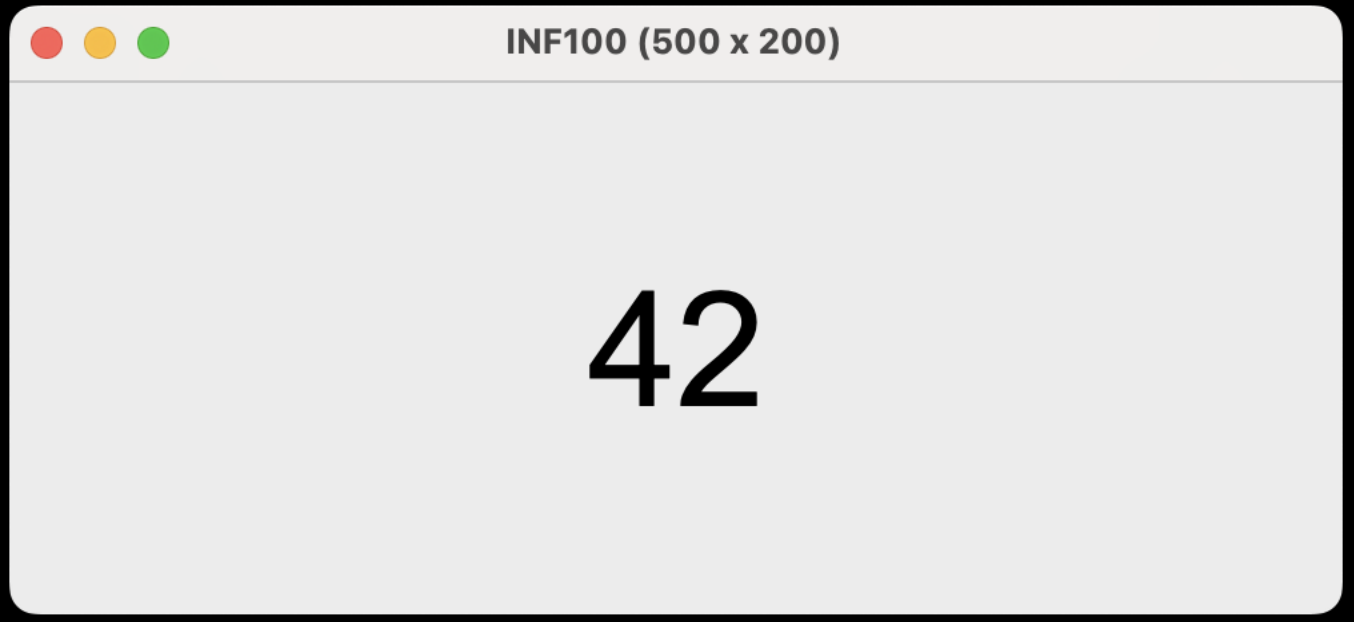
```
def draw_ball_in_box(canvas, x1, y1, x2, y2):
    std_width = 200
    std_height = 200
    width = x2 - x1
    height = y2 - y1
    w_factor = width / std_width
    h_factor = height / std_height

    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

```python
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)
```

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

for å starte programmet

```python
from uib_inf100_graphics.event_app import run_app

def app_started(app):
    app.count = 42

def key_pressed(app, event):
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    canvas.create_text(cx, cy, text=f'{app.count}', font='Arial 60')

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

kalles når programmet starter

```python
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)
```

tenk på app som en samling med variabler

```python
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)
```

oppretter en ny variabel «count»

```python
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)
```

kalles (av uib_inf100_graphics) når lerretet skal tegnes

```python
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)
```

tegning gjøres akkurat som før

```python
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)
```

variabler for width og height finnes i app fra før

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

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

variabel vi nettopp opprettet i app_started

```python
from uib_inf100_graphics.event_app import run_app

def app_started(app):
    app.count = 42

def key_pressed(app, event):
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def redraw_all(app, canvas):
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    canvas.create_text(cx, cy, text=f'{app.count}', font='Arial 60')

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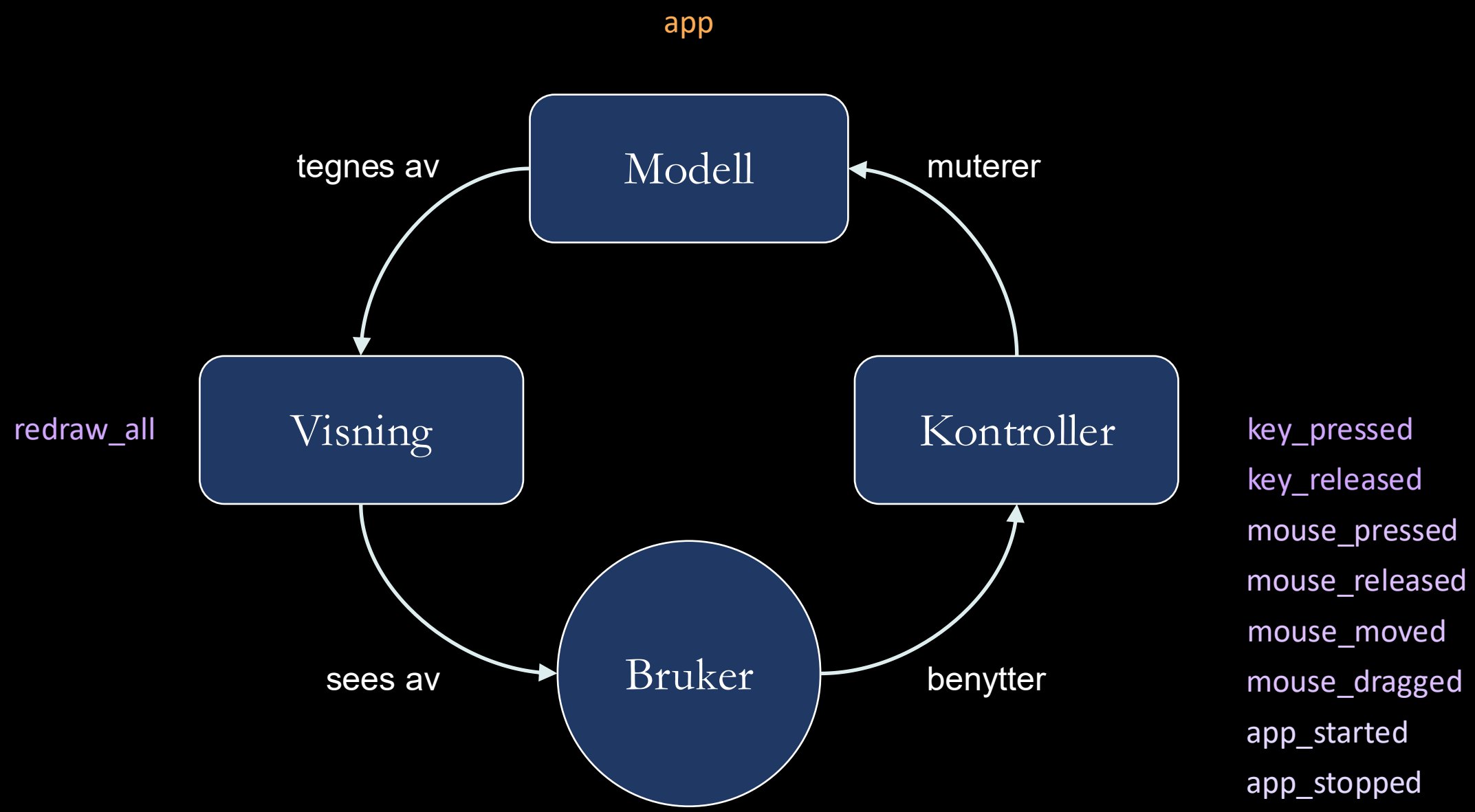
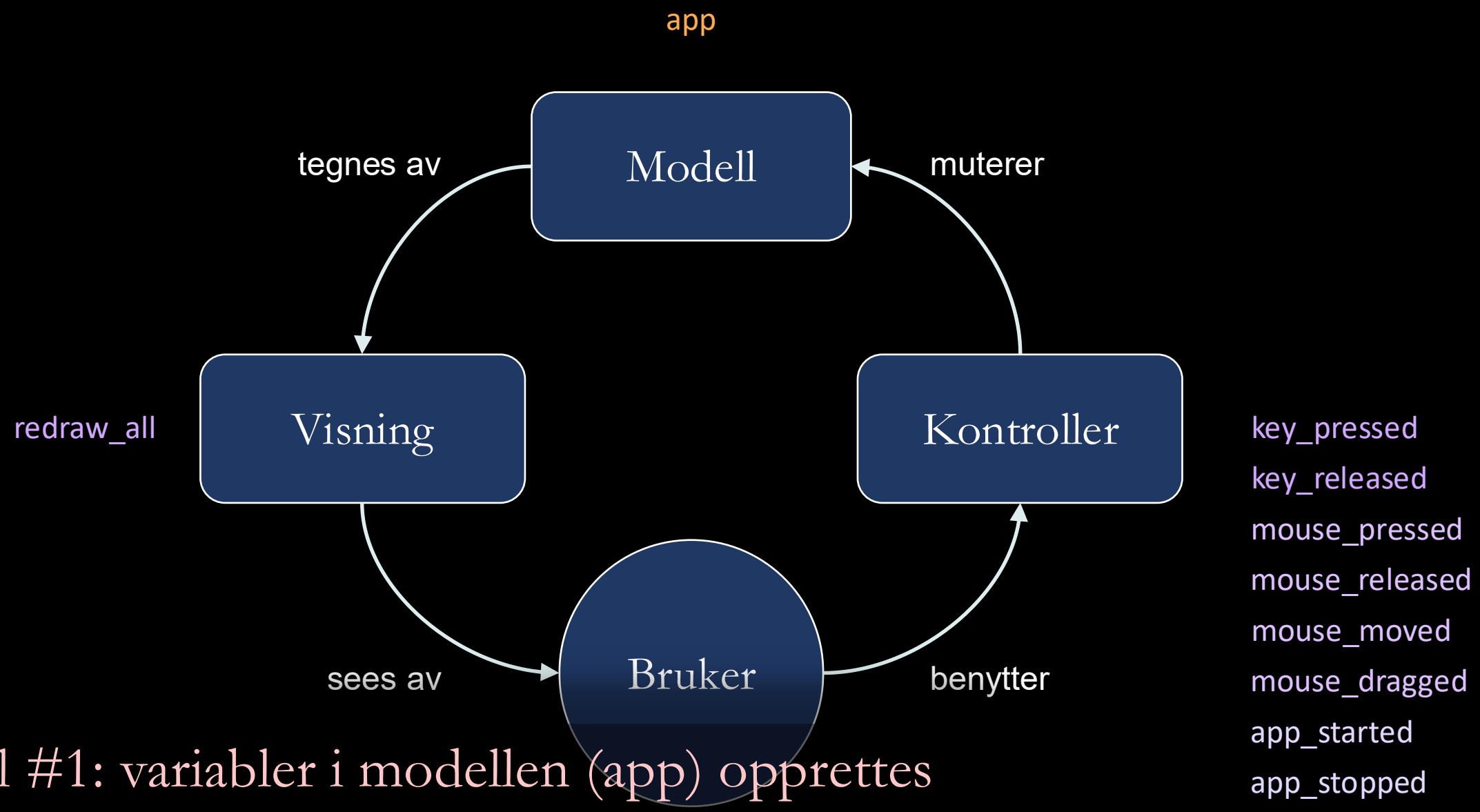
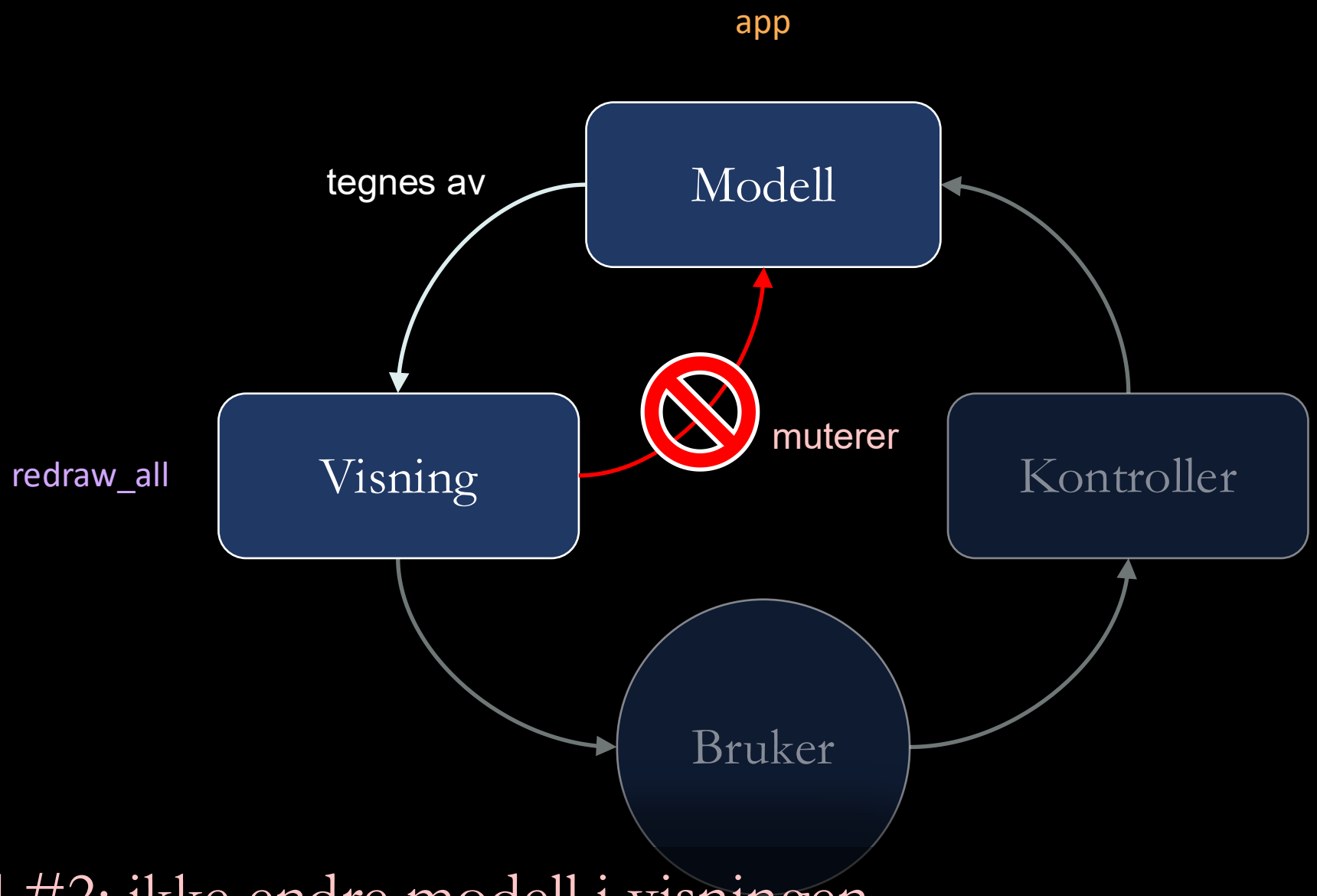

kalles hver gang en tast trykkes

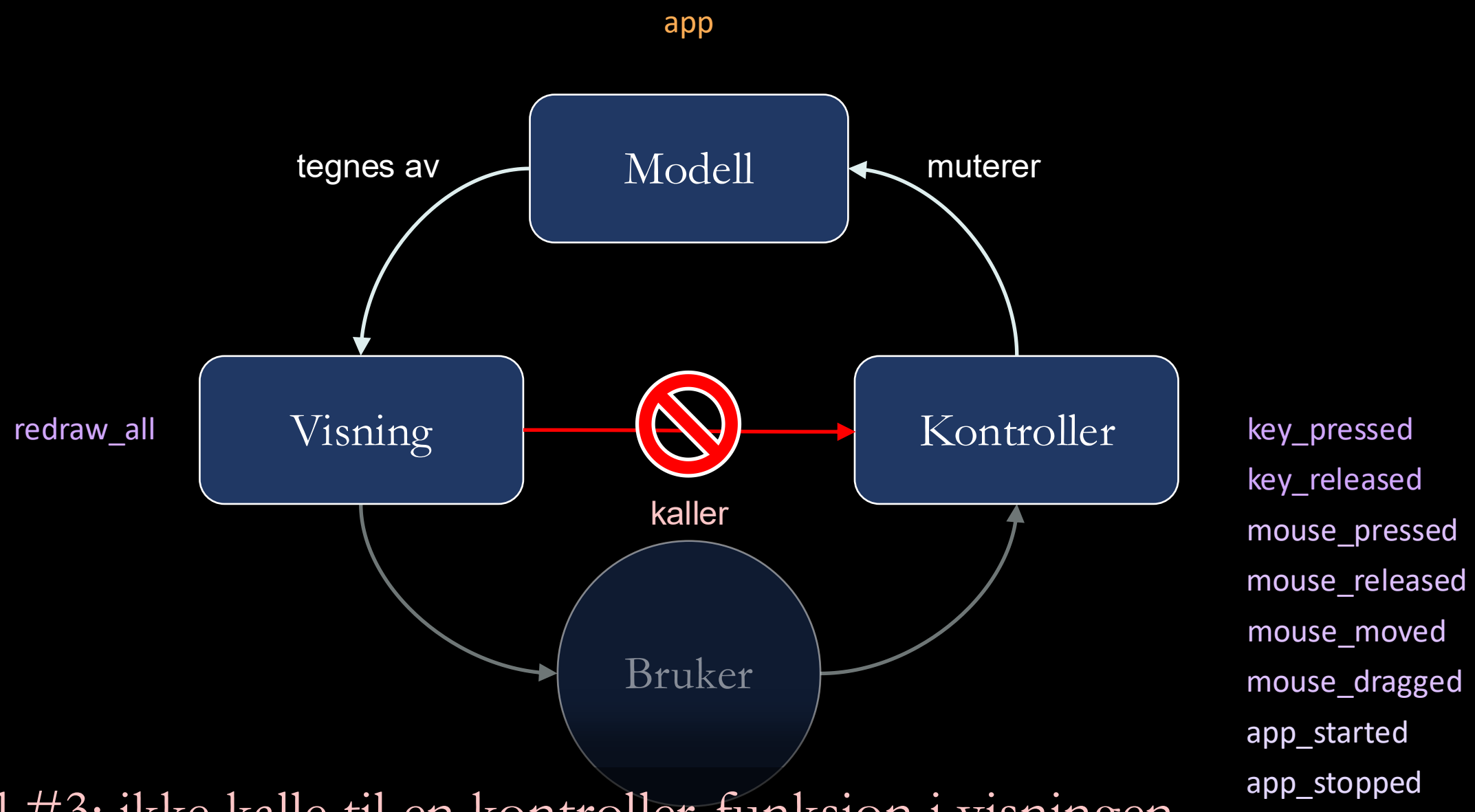

app
Modell
tegnes av
muterer
Visning
Kontroller
redraw_all
sees av
Bruker
benytter
key_pressed
key_released
mouse_pressed
mouse_released
mouse_moved
mouse_dragged
app_started
app_stopped
timer_fired



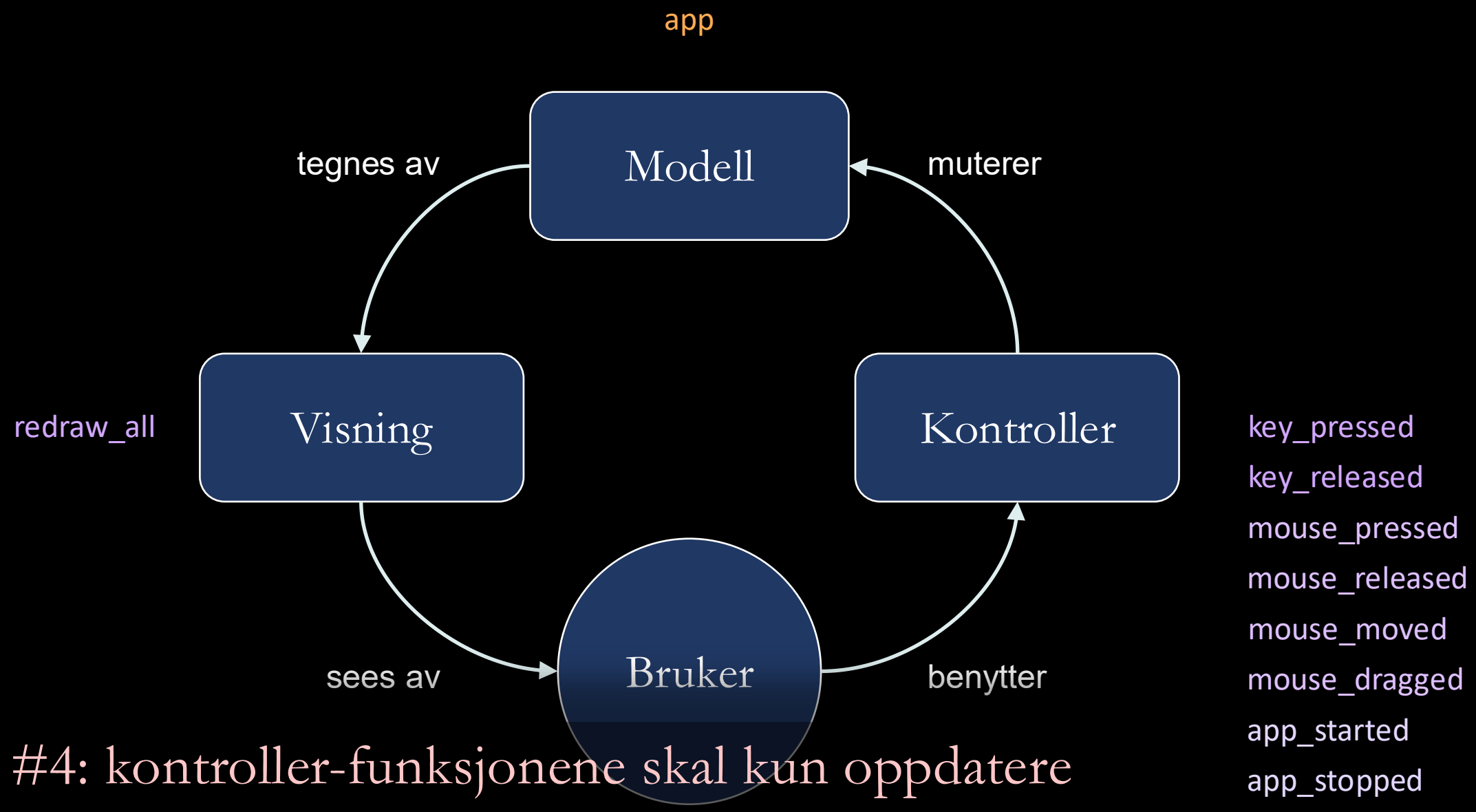
Regel #1: variabler i modellen (app) opprettes første gang i funksjonen app_started



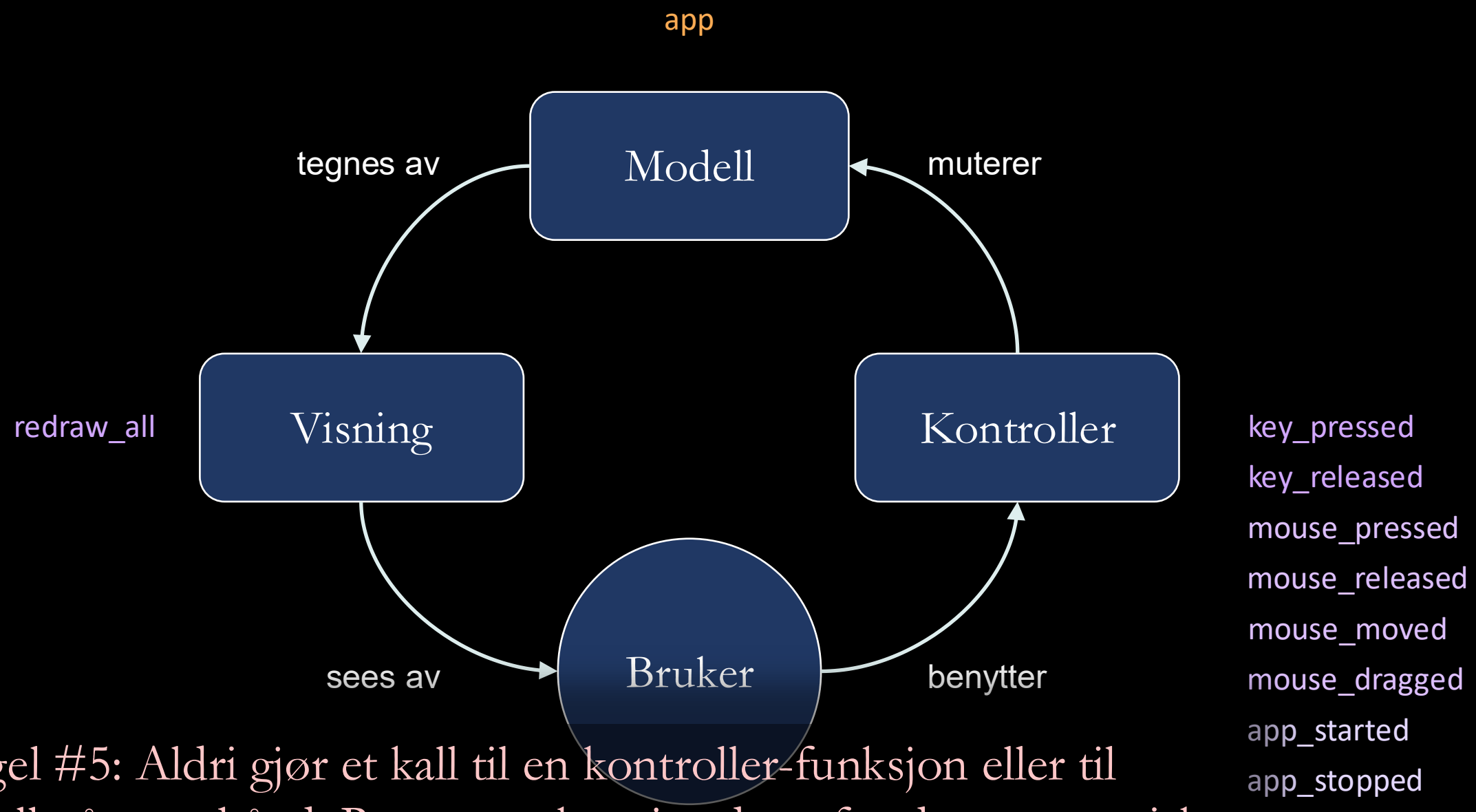
Regel #2: ikke endre modell i visningen



Regel #3: ikke kalle til en kontroller-funksjon i visningen



Regel #4: kontroller-funksjonene skal kun oppdatere modellen (app), de skal ikke oppdatere visningen



Regel #5: Aldri gjør et kall til en kontroller-funksjon eller til redraw_all på egen hånd. Rammeverket gjør dette for deg automatisk.