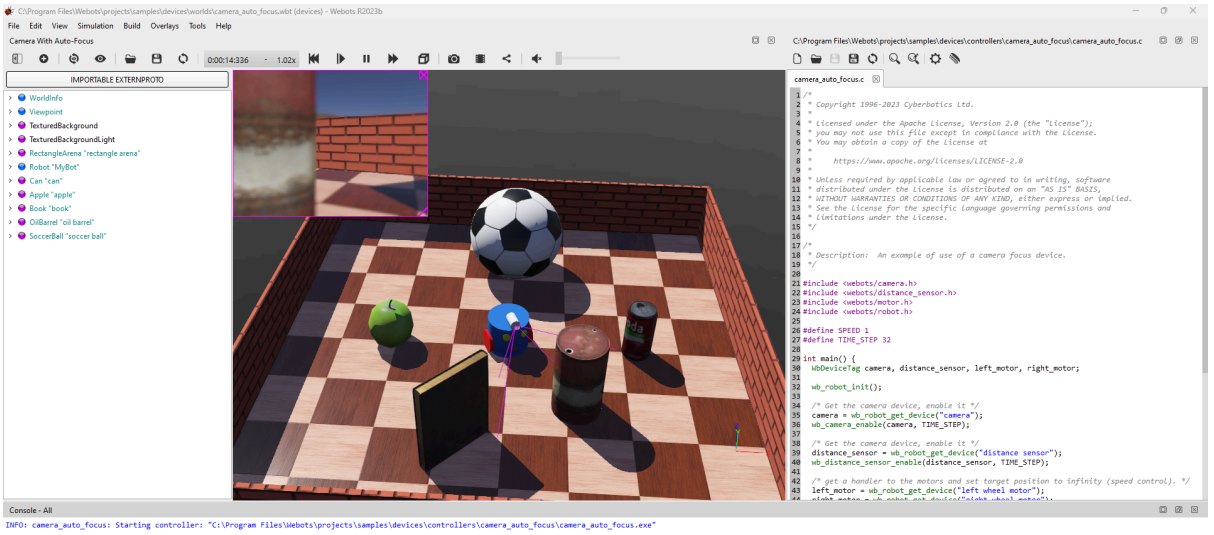
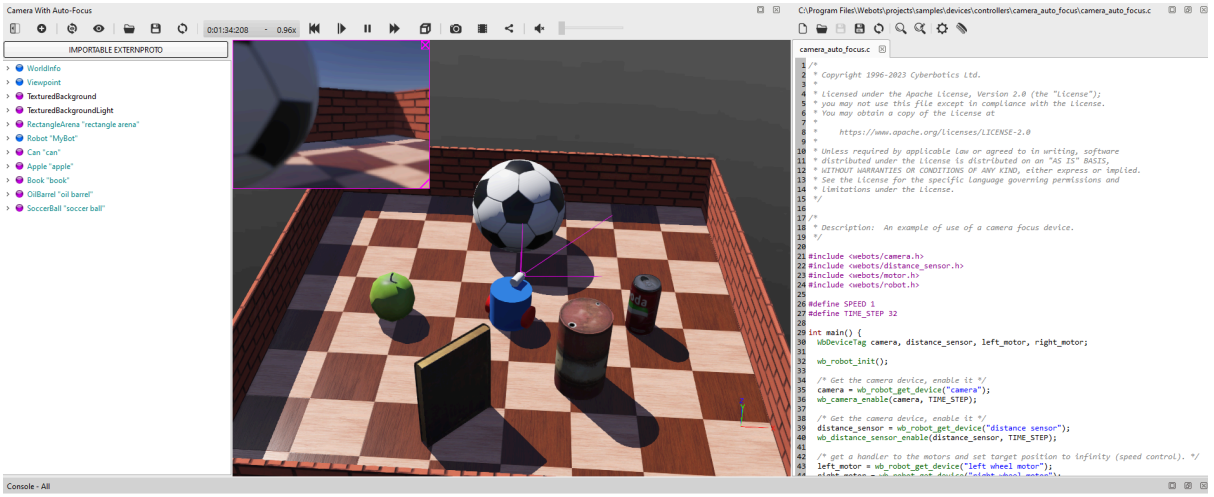
Nama : Imam Algiza
NIM : 1103200077
TUGAS WEEK 10 ROBOTIKA

1. Buka webots dan open sample world “camera_auto_focus.wbt”



2. Jalankan simulasi



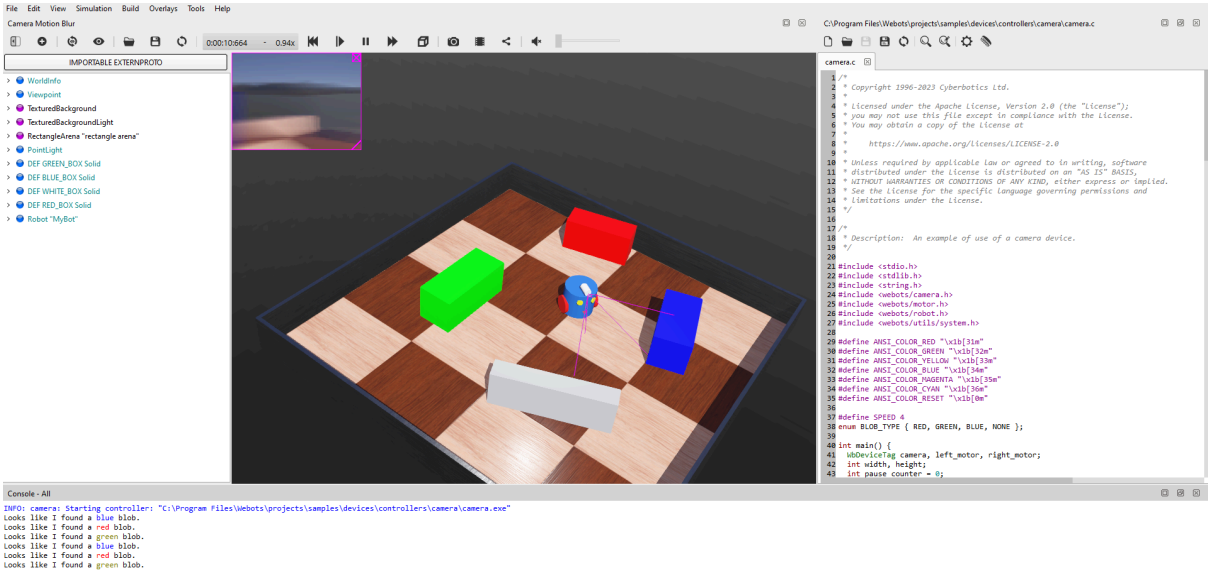
3. Source code untuk simulasi camera with auto focus

```
#include <webots/camera.h>
#include <webots/distance_sensor.h>
#include <webots/motor.h>
#include <webots/robot.h>

#define SPEED 1
#define TIME_STEP 32

int main() {
```

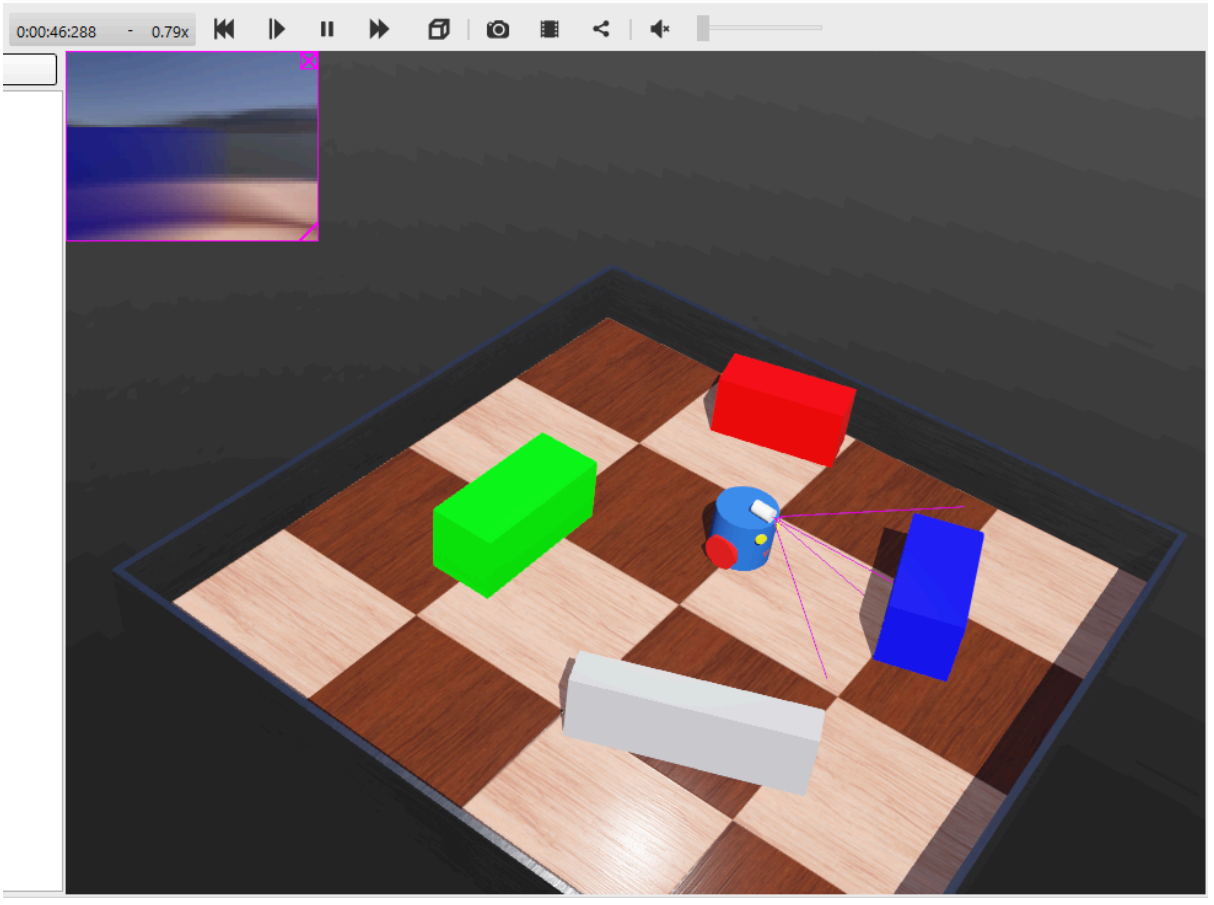
```
  WbDeviceTag camera, distance_sensor, left_motor,
right_motor;

  wb_robot_init();

  /* Get the camera device, enable it */
  camera = wb_robot_get_device("camera");
  wb_camera_enable(camera, TIME_STEP);

  /* Get the camera device, enable it */
  distance_sensor = wb_robot_get_device("distance sensor");
  wb_distance_sensor_enable(distance_sensor, TIME_STEP);

  /* get a handler to the motors and set target position to
infinity (speed control). */
  left_motor = wb_robot_get_device("left wheel motor");
  right_motor = wb_robot_get_device("right wheel motor");
  wb_motor_set_position(left_motor, INFINITY);
  wb_motor_set_position(right_motor, INFINITY);

  /* Set the motors speed */
  wb_motor_set_velocity(left_motor, -SPEED);
  wb_motor_set_velocity(right_motor, SPEED);

  /* Main loop */
  while (wb_robot_step(TIME_STEP) != -1) {
    const double object_distance =
wb_distance_sensor_get_value(distance_sensor) / 1000;
    wb_camera_set_focal_distance(camera, object_distance);
  }

  wb_robot_cleanup();

  return 0;
}
```

Yang terjadi pada codingan diatas adalah setelah selesai menginisiasi kamera, sensor dan motor penggerak. Kodingan berisi function membuka kamera, memutar motor penggerak ke kanan ataupun kekiri sebanyak “infinity” yang artinya robot akan selalu berputar, dan mengatur kecepatan motor berputar disini di set menjadi 1 dan jika ingin menambahkan kecepatan perlu ditambahkan value pada line `#define SPEED 1`. Dan terakhir berisi loop untuk menjalankan semua fungsi diatas.

4. open sample world “camera_motion_blur.wbt”



5. Jalankan simulasi camera motion blur



6. Source code camera motion blur

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <webots/camera.h>
#include <webots/motor.h>
#include <webots/robot.h>
```

```
#include <webots/utils/system.h>

#define ANSI_COLOR_RED "\x1b[31m"
#define ANSI_COLOR_GREEN "\x1b[32m"
#define ANSI_COLOR_YELLOW "\x1b[33m"
#define ANSI_COLOR_BLUE "\x1b[34m"
#define ANSI_COLOR_MAGENTA "\x1b[35m"
#define ANSI_COLOR_CYAN "\x1b[36m"
#define ANSI_COLOR_RESET "\x1b[0m"

#define SPEED 4
enum BLOB_TYPE { RED, GREEN, BLUE, NONE };

int main() {
  WbDeviceTag camera, left_motor, right_motor;
  int width, height;
  int pause_counter = 0;
  int left_speed, right_speed;
  int i, j;
  int red, blue, green;
  const char *color_names[3] = {"red", "green", "blue"};
  const char *ansi_colors[3] = {ANSI_COLOR_RED,
ANSI_COLOR_GREEN, ANSI_COLOR_BLUE};
  const char *filenames[3] = {"red_blob.png",
"green_blob.png", "blue_blob.png"};
  enum BLOB_TYPE current_blob;

  wb_robot_init();

  const int time_step = wb_robot_get_basic_time_step();

  /* Get the camera device, enable it, and store its width
and height */
  camera = wb_robot_get_device("camera");
  wb_camera_enable(camera, time_step);
  width = wb_camera_get_width(camera);
  height = wb_camera_get_height(camera);

  /* get a handler to the motors and set target position to
infinity (speed control). */
  left_motor = wb_robot_get_device("left wheel motor");
  right_motor = wb_robot_get_device("right wheel motor");
  wb_motor_set_position(left_motor, INFINITY);
  wb_motor_set_position(right_motor, INFINITY);
  wb_motor_set_velocity(left_motor, 0.0);
  wb_motor_set_velocity(right_motor, 0.0);

  /* Main loop */
  while (wb_robot_step(time_step) != -1) {
    /* Get the new camera values */
    const unsigned char *image =
wb_camera_get_image(camera);

    /* Decrement the pause_counter */
    if (pause_counter > 0)
```

```
      pause_counter--;

    /*
     * Case 1
     * A blob was found recently
     * The robot waits in front of it until pause_counter
     * is decremented enough
     */
    if (pause_counter > 640 / time_step) {
      left_speed = 0;
      right_speed = 0;
    }
    /*
     * Case 2
     * A blob was found quite recently
     * The robot begins to turn but don't analyse the image
for a while,
     * otherwise the same blob would be found again
     */
    else if (pause_counter > 0) {
      left_speed = -SPEED;
      right_speed = SPEED;
    }
    /*
     * Case 3
     * The robot turns and analyse the camera image in
order
     * to find a new blob
     */
    else if (!image) {  // image may be NULL if
Robot.synchronization is FALSE
      left_speed = 0;
      right_speed = 0;
    } else {  // pause_counter == 0
      /* Reset the sums */
      red = 0;
      green = 0;
      blue = 0;

      /*
       * Here we analyse the image from the camera. The
goal is to detect a
       * blob (a spot of color) of a defined color in the
middle of our
       * screen.
       * In order to achieve that we simply parse the image
pixels of the
       * center of the image, and sum the color components
individually
       */
      for (i = width / 3; i < 2 * width / 3; i++) {
        for (j = height / 2; j < 3 * height / 4; j++) {
          red += wb_camera_image_get_red(image, width, i,
j);
          blue += wb_camera_image_get_blue(image, width, i,
```

```
j);
          green += wb_camera_image_get_green(image, width,
i, j);
        }
      }

      /*
       * If a component is much more represented than the
other ones,
       * a blob is detected
       */
      if ((red > 3 * green) && (red > 3 * blue))
        current_blob = RED;
      else if ((green > 3 * red) && (green > 3 * blue))
        current_blob = GREEN;
      else if ((blue > 3 * red) && (blue > 3 * green))
        current_blob = BLUE;
      else
        current_blob = NONE;

      /*
       * Case 3a
       * No blob is detected
       * the robot continues to turn
       */
      if (current_blob == NONE) {
        left_speed = -SPEED;
        right_speed = SPEED;
      }
      /*
       * Case 3b
       * A blob is detected
       * the robot stops, stores the image, and changes its
state
       */
      else {
        left_speed = 0;
        right_speed = 0;
        printf("Looks like I found a %s%s%s blob.\n",
ansi_colors[current_blob], color_names[current_blob],
ANSI_COLOR_RESET);
        // compute the file path in the user directory
        char *filepath;
#ifdef _WIN32
        const char *user_directory =
wbu_system_short_path(wbu_system_getenv("USERPROFILE"));
        filepath = (char *)malloc(strlen(user_directory) +
16);
        strcpy(filepath, user_directory);
        strcat(filepath, "\\");
#else
        const char *user_directory =
wbu_system_getenv("HOME");
        filepath = (char *)malloc(strlen(user_directory) +
16);
```

```
        strcpy(filepath, user_directory);
        strcat(filepath, "/");
#endif
        strcat(filepath, filenames[current_blob]);
        wb_camera_save_image(camera, filepath, 100);
        free(filepath);
        pause_counter = 1280 / time_step;
      }
    }

    /* Set the motor speeds. */
    wb_motor_set_velocity(left_motor, left_speed);
    wb_motor_set_velocity(right_motor, right_speed);
  }

  wb_robot_cleanup();

  return 0;
}
```

Kode diatas berisikan function untuk mencari dan medeteksi objek didepannya yang berwarna merah, hijau dan biru. motor akan bergerak secara terus menerus dengan kecepatan dan arah yang konstan hingga menemukan salah satu objek dengan warna diatas, saat itu robot akan berhenti sejenak dan menyimpan gambar lalu memberikan output “looks like I found (warna) blob. pada console. setelah itu robot akan berputar lagi dan memberikan efek motion blur hingga menemukan objek dengan warna diatas lagi, lalu proses akan terulang kembali.