# PRESIDENT UNIVERSITY

**3D CGA - Project Report**

# "Urban Night City"

## I. Character Profiles

### A. Main Character

**Character Name:**

**Tuti**

**Description:**

Tuti is an unassuming yet curious young girl who has a knack for wandering through the dimly lit streets of an urban city at night. Her surroundings, often damp and heavy with the echoes of the city's melancholia, do little to dampen her spirit. Despite the despair that cloaks her environment, she carries a quiet cheerfulness within her.

Tuti is a stylized, low-poly 3D character with a simplistic yet charming design. She has a featureless, rounded face framed by

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| | medium-length brown hair that falls evenly on both sides. Tuti wears a bright yellow, oversized sweater with orange cuffs, giving her a cozy, casual appearance. Her blue pants feature distinct, blocky knee sections, adding a playful touch to her outfit, while her feet are modeled simply, without detailed footwear. The bright color palette and geometric shapes reflect a cheerful, approachable vibe, making Tuti well-suited for light-heartedness. |

**B. Companion**

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|  | **Companion Name:**<br>**Agus**<br><br>**Description:**<br>Agus is a sleek, low-poly black cat with a minimalist, geometric design. Agus body is dark gray with lighter gray accents on the feet and tail tip, and Agus wears a vibrant red collar that provides a striking contrast, hinting at its importance or connection to someone. Agus upright stance and erect tail exude confidence and alertness, while the dark coloration adds an air of mystery. The simple, angular features and bold style make the visually distinctive, perfect for modern or stylized settings like games or animations. |

**C. Props**

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|  | **Props Name:**<br>**Umbrella**<br><br>**Description (optional):**<br>Tuti's umbrella is a practical and reliable accessory she carries during her walks in the rain. It is large enough to provide full coverage, protecting her from the light drizzle while she navigates the wet streets. The umbrella is simple yet sturdy, made of water-resistant material that withstands the occasional breeze. Its design is unassuming, with a classic shape that matches Tuti's calm and pragmatic nature. As she walks, the umbrella ensures she stays dry and comfortable, offering both physical protection and a sense of security amid the rainy cityscape. |

**D. Background Story**

It was a quiet evening in the heart of the city. The usual hum of traffic was muffled by the light drizzle that lingered after a heavy downpour. Rain had left the streets shimmering with puddles, reflecting the neon glow of shop signs and the passing headlights of cars. The comforting scent of petrichor filled the air, giving the neighborhood a calm, almost serene feel as if the rain had momentarily washed away the city's daily chaos.

By Tuti's side padded Agus, her loyal feline companion. With fur as dark as the night, Agus was easy to miss in the dimly lit streets, but his quiet presence was a constant source of comfort. He had appeared one stormy night years ago, a soaked and shivering stray who had found refuge under Tuti's umbrella. Since then, they had been inseparable, sharing a silent bond forged in the rhythm of rainy nights.

This evening, their destination was the familiar glow of Indomaret at the corner of the block. The store, with its bright fluorescent lights, felt like a cozy oasis amid the damp streets. Tuti picked up a few essentials, the soft sound of her footsteps echoing against the tiled floors. Agus waited patiently at the entrance, his green eyes reflecting the warmth of the interior.

Tuti entered the Indomaret with her umbrella while Agus kept his paw happy while waiting for her to finish shopping. The rain continued to fall in a gentle rhythm, forming small ripples in the puddles and softening the glow of the city lights. Together, they continue walking, unhurried and unperturbed by the drizzle. It was a quiet ritual for them to enjoy the silence of the night, the rhythm of the rain, and the comfort of each other's company.

# II. Technical Aspects

## A. Modeling Approach

### 1. Flow and Step

#### a. Initial Planning and Theme Selection:

The project began with a discussion to determine the theme from three options: Space, Urban City, and Ancient City. After thorough deliberation, we chose the Urban City theme. Our vision was to create a scene set at night under the rain, capturing a moody and lonely atmosphere inspired by neon-lit streets. This thematic choice guided our artistic and technical decisions throughout the project.

#### b. Reference Collection:

To bring our vision to life, we gathered visual references from various sources, including YouTube tutorials, Google Images, and examples of low-poly assets on paid websites (used strictly for inspiration without purchase). These references helped us understand the proportions, details, and aesthetic we wanted to achieve.

#### c. Task Division and Collaboration:

Once the references were finalized, the team divided the modeling tasks based on individual strengths and workload balance. Each member was responsible for modeling specific objects within the scene. After shaping the initial models using the references, we reconvened for a collaborative review session. During this session, we evaluated each object, identified areas for improvement, and made necessary adjustments to ensure consistency and coherence across the scene.

### 2. What techniques were used to achieve specific shapes or proportions? (select from the hardest part of the project)

#### a. Mirror Add-ons for Character Modeling

Character modeling was a critical yet challenging part of the project, particularly in achieving accurate proportions and symmetry. While the Mirror Modifier built into the software was useful for basic mirroring, it presented several limitations, such as creating artifacts at the seam lines or failing to align

vertices perfectly. To address these issues, we opted for a dedicated Mirror Add-on that allowed for more advanced control. Here's a breakdown of the process:

i. **Initial Base Mesh Creation:**

We started by sculpting a rough base mesh for one side of the character, focusing on accurate proportions and overall structure.

ii. **Applying the Mirror Add-on:**

Once the base mesh was ready, we activated the Mirror Add-on, which provided options to refine the mirrored geometry dynamically. This included tools for adjusting symmetry axes, auto-welding vertices, and smoothing seam lines.

iii. **Manual Adjustments:**

Despite the add-on's capabilities, minor imperfections persisted. We manually tweaked vertices near the symmetry line to eliminate irregularities, ensuring smooth transitions and a balanced appearance.

iv. **Final Refinement:**

Additional sculpting and subdivision were applied to refine smaller details, such as facial features and muscle definition, making the character more lifelike.

**b. Cloth and Raindrop Particles**

Simulating realistic cloth and raindrop behavior posed its own set of challenges due to collision errors and incorrect physics interactions. Here's a detailed breakdown of how we handled these issues:

**Cloth Simulation:**

i. **Modeling the Cloth:**

We began by modeling the cloth object using a simple plane or grid. The resolution of the cloth mesh was increased to ensure it had enough geometry to deform realistically during the simulation.

ii. **Applying Cloth Physics:**

Cloth physics were applied using the physics properties panel, where we adjusted parameters like stiffness, bend, and damping to achieve realistic movement.

**iii. Collision Setup:**

To avoid issues with objects interacting incorrectly (e.g., the cloth penetrating the character's body), we carefully assigned collision modifiers to both the cloth and the character model.

1. We scaled the collision objects slightly larger to ensure the cloth interacted with the outer surfaces.
2. Subsurface settings were fine-tuned to reduce computational errors.

**iv. Iterative Testing:**

Through multiple simulations, we adjusted the cloth's weight and wind effects to achieve a natural flow. Additional tweaks to vertex groups allowed us to control how specific areas of the cloth reacted to external forces.

**Raindrop Particles:**

**i. Particle System Setup:**

A particle system was used to simulate raindrops. We created a simple droplet object, assigned it as an instance to the particle system, and controlled its spawn rate and distribution.

**ii. Collision Adjustments:**

The biggest issue was raindrops colliding incorrectly with the inner faces of objects. We resolved this by:

1. Enabling self-collision to prevent particles from intersecting.
2. Reducing the geometry of the collision object to only include outer surfaces.
3. Increasing friction values in the collision settings to ensure that raindrops slid naturally along surfaces rather than bouncing unrealistically.

iii. **Custom Behaviors:**

To enhance realism, we used dynamic paint maps to simulate wet surfaces where raindrops landed. These maps influenced material properties, adding reflections and darker tones to wet areas.

iv. **Rendering the Scene:**

After finalizing simulations, the scene was rendered with motion blur and depth-of-field effects to give the raindrops and cloth an authentic, cinematic look.

**B. Texture/Material**

**1. Procedural Textures for Complex Effects**

**a. City Streets and Sidewalks (Trotoar)**

**Material**: Color Ramp and Noise Texture

**Purpose**: To create a realistic puddle effect on the streets while retaining the low-poly aesthetic. The combination of Color Ramp and Noise Texture effectively mimics the irregular reflections and roughness of wet surfaces.

**b. Traffic Lights**

**Material**: Texture Coordinate, Mapping, Wave Texture, Multiply, and Bump Mapping

**Purpose**: Multiple nodes and settings were used to achieve a realistic traffic light material, particularly for the glowing effect and fine details. These techniques contribute to the urban atmosphere of the city by replicating functional, illuminated traffic lamps.

**c. Burnt Cigarettes**

**Material**: Voronoi Texture, Color Ramp, and Mixing Nodes

**Purpose**: This combination creates a burnt texture for the cigarette model, adding fine detail to represent charred edges realistically.

**2. Textures for Architectural and Structural Elements**

**a. Apartment Behind the Indomaret**

**Material**: Brick Texture

**Purpose**: Adding a brick texture enhances the realism of the building, breaking up monotony and making the facade more visually dynamic.

b. **Storefronts and Doors**

**Material**: Metallic Materials

**Purpose**: The metallic material is used for the door frames to replicate the reflective and solid appearance of iron or steel. This material is also applied to the tables and chairs of the café and Indomaret, though different colors are used to distinguish between the two settings.

c. **Poles and Other Metallic Structures**

**Models**: Bus stop poles, traffic light poles, trash cans, and streetlight poles

**Material**: Metallic Materials

**Purpose**: These structures use metallic materials to maintain a consistent aesthetic across urban elements while balancing low-poly constraints and realistic reflections.

3. **Glass Materials**

a. **Café and Indomaret Windows**

**Material**: Glass BSDF and Transparent BSDF

**Purpose**: To achieve the appearance of glass while keeping polygon counts low. The transparency and reflective properties help convey realism and distinguish the windows from other objects.

b. Car and Bus Windows

Material: Glass BDSF

4. **Image Textures**

a. **Bags of Chips**

**Material**: High-Resolution Image Texture

**Purpose**: The image texture adds intricate details and branding to the chips bag, making the object more lifelike and attention-grabbing.

b. **Halte Posters**

**Material**: UV Mapping with Image Texture

**Purpose**: The posters use UV wrapping for precise placement, ensuring the images align seamlessly with the model surfaces, adding realism and context to the bus stop area.

5. **Simplified and Basic Materials**
    a. **Other Urban Objects**

    **Models**: Background apartments, cars, buses, Agus and Tuti (characters), Indomaret's shelves, plants, and trees

    **Material**: Principled BSDF

    **Purpose**: Basic Principled BSDF materials are used for these objects to maintain simplicity while still offering sufficient realism for background and secondary elements.

# III. Final Reflections

## A. Team Contribution

| Name | Task |
|---|---|
| Aditnya Pamungkas | Lamp with flickering effect, Traffic light, Trash can with cigarette, Apartment modeling, idle character animation, Credit scene environment set, Shophouse modeling, Shophouse Items |
| Angelica Suti Whiharto | Floor design, Indomaret with sliding door, Café, Indomaret items, Environment modeling, Plants and trees, Apartment modeling, Chairs and Tables in Both Indomaret and Cafe. |
| Bagus Eka Bagaskara | Cat with rigging and animation, Umbrella, Rain with splashes, Bus stop (Halte) with texturing, Environment design, Credit scene Character and Cat animations, Apartment modeling, Set Camera and Animation |
| Intan Kumala Pasya | Bus, Car, Building modeling, Car and Bus animation |
| Mohammad Nabil Hanif | Main character modeling, Rigging, animation |

## B. Learning Outcomes

Reflecting on the skills and knowledge gained by the group through this project, several key learnings stand out as important milestones in the creative process. These learnings span across technical, artistic, and collaborative aspects of the project, demonstrating the team's growth and ability to handle a range of complex tasks.

### 1. 3D Modeling & Texturing

**Modeling Techniques and Asset Creation:**

Throughout the project, team members honed their skills in 3D modeling, creating various assets such as vehicles, characters, and environmental props. This process enhanced our ability to craft detailed, realistic models that align with the project's aesthetic and technical requirements. By applying a variety of texturing methods, such as procedural and image-based textures, the team was able to breathe life into these models, ensuring they were visually compelling while maintaining the intended low-poly style for performance optimization.

**Material Creation:**

The application of materials such as glass, fabric, and metal required an in-depth understanding of shading principles and how materials interact with light. For instance, the use of Glass and Transparent BSDF shaders allowed us to create realistic windows and transparent surfaces, while the Puddle material was achieved through Noise and Color Ramp nodes, simulating water reflections on the street. These texturing methods significantly contributed to the visual authenticity of the project.

### 2. Animation & Rigging

**Rigging and Character Animation:**

Team members contributed to the rigging and animation of both character models (such as Tuti and Agus) and mechanical objects (like cars). The use of Rigify for rigging allowed us to efficiently create bone structures for characters, which were then animated to perform actions such as walking and interacting with the environment. This skill is critical for animating lifelike movements in both organic and mechanical models.

**Mechanical Animation with Follow Path:**

For vehicles and other moving objects, Follow Path constraints were used to animate smooth, realistic motion along predefined paths. This technique was instrumental

in ensuring that vehicles and characters like Tuti and Agus moved fluidly through the scene, contributing to the realism of the animation.

**Flickering and Dynamic Lighting:**

In addition to animation, we explored dynamic lighting effects such as flickering lamps and rain splashes. Using the Graph Editor, we controlled the intensity and frequency of the flickering effect, combining it with Noise, Steps, and Limits to create a more unpredictable, organic light behavior. This process added a layer of realism to the lighting setup, making the environment feel more dynamic and responsive to the surroundings.

3. **Lighting & Effects**

**Dynamic Lighting and Effects:**

The creation of realistic lighting and environmental effects was an essential component of this project. The team utilized Particle Systems and Collision modifiers to simulate rain and water splashes, enhancing the realism of outdoor scenes. The addition of flickering street lamps using the Graph Editor helped to set a moody and atmospheric tone for nighttime settings. These lighting and particle effects not only contributed to the visual richness of the project but also played a significant role in establishing the scene's overall mood.

**Rain and Environmental Effects:**

The particle system was also used for rain effects, with careful attention given to particle behavior and collision with the ground. This helped to simulate the natural interaction between falling raindrops and the environment, adding a layer of immersion to the scene. These techniques were essential for conveying dynamic weather conditions and reinforcing the realism of the world.

4. **Environmental Design**

**Spatial Planning and Asset Placement:**

The creation of environments like an apartment, café, and Indomaret store required strong spatial planning skills. Proper asset placement, scaling, and optimization ensured that each scene felt cohesive and functional. We carefully arranged assets to enhance visual appeal while maintaining a consistent aesthetic throughout the

environment. Optimization techniques, such as using low-poly models for background elements, ensured that the scenes ran smoothly without sacrificing visual quality.

**Detailed and Functional Design:**

The design process focused on creating environments that were not only visually appealing but also functional within the project's context. For instance, we used clothing simulation for tablecloths and rigid body simulations for objects like chairs and tables to ensure that physical interactions were believable and the objects reacted realistically within the environment.

5. **Collaboration and Project Management**

**File Exchange and Data Management:**

Efficient collaboration and resource management were critical throughout the project. The use of Auto Pack Resources and Data Purge tools allowed us to exchange files between devices while preserving UV wrapping and avoiding unnecessary data bloat. By purging unused data, we ensured that the final project files were clean, organized, and free of redundant elements, which streamlined the workflow and facilitated smooth collaboration.

**Role Distribution and Task Management:**

Clear role definition and task distribution within the team allowed each member to focus on their areas of expertise, ensuring that all aspects of the project, from modeling and animation to lighting and effects, were covered in detail. This structured approach helped keep the project on track and ensured that each member could contribute their skills in an organized manner, simulating real-world project management scenarios.

## C. Challenges

### 1. Making a Perfect Rig

At the beginning of the rigging process, one of our team members encountered a significant misunderstanding regarding the fundamental differences between traditional bone rigging and auto-rigging. This confusion arose from a lack of clarity on the specific rigging methods required for the project. It took an entire day of troubleshooting and discussion to realize that only one type of rigging system could be implemented effectively for our project. After carefully evaluating our options, we decided to utilize

the auto-rigging feature provided by Mixamo. The primary reason for this decision was that the Mixamo auto-rigging system was highly adaptable to our character's body proportions, ensuring accurate and seamless rigging. With the rigging phase completed, we proceeded to create and refine the animations manually, ensuring they aligned with our project's artistic and functional requirements.

2. **Hardware Incompatibilities**

   During the modeling phase, we aimed to include various objects typically found in an Indomaret setting, such as bags of chips, Le Minerale bottles, and a gallon placed at the storefront. However, hardware incompatibility issues posed significant challenges. These problems arose due to the high polygon count and complex geometry of certain models, which strained our rendering and processing capabilities. To address these limitations, we had to repeatedly decimate and remesh the models to optimize their performance. Despite our efforts, we ultimately decided to remove the Le Minerale bottles entirely and substitute them with simpler, less resource-intensive objects that were easier to render. This compromise ensured the project remained visually coherent without overwhelming our hardware resources.

3. **Pack Resources**

   As our team collaboratively modeled objects across different laptops, we encountered issues related to the consistency of UV wrapping and texture mapping when transferring files between devices. To address this, we employed the "Pack Resources" function, which bundles all textures, UV maps, and related assets within the project file. However, repeated file transfers over time led to errors, including corrupted resource packs. Resolving this issue required significant troubleshooting, taking approximately an hour to identify a reliable solution. We discovered that using the "Clean Data - Purge Unused Data" function in our software allowed us to remove redundant or conflicting data. Afterward, we re-packed the resources, ensuring file integrity and seamless collaboration among team members.

4. **Path-Follow**

   For two specific characters, Tuti and Agus, we intended to use the Path Follow modifier to guide their movements along predefined trajectories. However, implementing this feature proved to be more challenging than anticipated. While setting up the

path-follow animation, we attempted to combine it with keyframe animation to achieve precise motion control. Despite our efforts, the system did not function as expected, resulting in inconsistencies in the characters' movements along the path. This necessitated further experimentation and adjustments to refine the settings, ensuring that the path-follow animation aligned correctly with the desired keyframe controls. This iterative process underscored the complexities of integrating automated path-follow features with manual animation techniques in a cohesive workflow.