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## **INTEGRATION OF ENGINEERING AND ARTISTIC APPROACH IN THE DESIGN PROCESS**

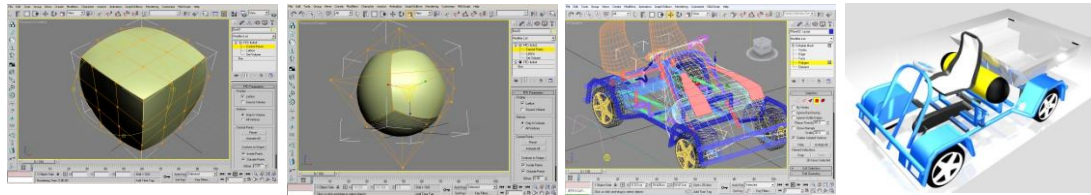
***Abstract:** This article deals with the problems of designing new vehicles associated with the necessity of combining engineering and artistic approaches in a project bike, the need to integrate the engineering and artistic approaches to the use of modern computer technology.*

***Keywords:** design, motorcycle, 3-D model, the volume-plastic transformation, proportioning, aligning, color and graphics solution.*

**Statement of the problem.** Modern vehicles are complex products of technology in which high demands of ergonomics and design. Therefore, the creators of new technology to solve complex problems of combining engineering, technical and creative artistic decisions that are often mutually exclusive, although engineers are confident that the perfect technical product always looks beautiful, we can not exclude the possibility of modern approaches to the design and decoration. This article discusses one of the variants of the project vehicle categories L-1 which includes motorcycles.

**Analysis of recent research and publications.** Leading manufacturers of motorcycles - Kawasaki, SUZUKI, etc. are continuously improving engineering skill with his image and distinctive design, marketing policy justified. Quality design is as important as excellent technical characteristics of developed machines. Engaging in learning design software, allowing flexible and fast to recreate three-dimensional image, visualize mathematical calculations during the development of a vehicle distributed rationally design time and effort, undoubtedly leads to increased levels of engineering design, develop spatial thinking future design engineers.

When creating an image of the future of the vehicle is necessary to control its free form, proportions, color scheme, etc. Selecting a method of changing 3-d models and modifier depends on the situation and assumes skills in transitional space. Simple exercises such as "transformation of the cube in a bowl" and other similar develop the ability to perceive the future engineer spatial forms as plastically modified structure (Ill. 1). It is also necessary to trust your intuition, and using the numeric entry to change the settings, and flatbed work "by hand". If this future designer master the basic skills of drawing, such as "light, halftone, shadow, reflection, speed and continuous stretch" and get the basic information in the sphere of art - a qualitatively higher level of engineering and design work is inevitable. One of the most common products today, allowing to cope with the tasks of design today is Autodesk 3ds Max.



*Ill. 1. Vocabulary - stages plastic transformation.*

**Goals of the Article.** Objective - analysis of possible ways and means of integrating engineering and artistic approaches the process of creating a concept vehicle design by maximizing the use of different methods of body-transforming plastic 3-D model, with the aim of creating and choosing the best solution from a range of options to suit all requirements for its design, ergonomics standards, etc.

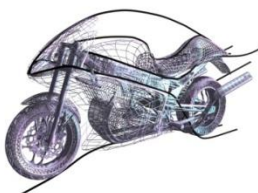
**The main part. Stages of building a model.** Peculiarity motorcycle concept design was mutual and simultaneous design and art direction of creative work. Single travel, road bike designed for city and intercity distances at the speed of movement of up to 160 km / h. Motorcycle light types with low weight. Emphasized dynamic appearance seeks to maximize aerodynamics, reducing the pressure force oncoming airflow to pilot.



*Ill. 2. Simulation mode transparent grid*

*Ill. 3. Used in constructing the model of motorcycle accessories to finishing form.*

Thus, the early stages of the engineer needs to think about the implementation of the development, design embodiment in specific materials. Often need to view the output stage design in transparent mode, to emphasize certain nodes color change material for shape correction. Shaping in the design of vehicles - rather, the phenomenon of plastic and not graphics.



*Ill. 4. The main line of motorcycle shaping allow air flow and landing pilot. 3-D model allows to reproduce the aerodynamic flows in motion image sodavaya harmoniously and integrally arranged machine.*

Basic Design Concepts - lightness, strength, speed and endurance emphasizes the original color scheme. Bright, sunny color contrast, interact with black gloss and chrome parts are arranged so that the machine stand out and was visible in any situation. Chrome motorcycle parts reflections "inscribe" motorcycle in the surrounding area, giving solidity at the actual ease.



*Ill. 5. Traversed path to the final decision of the selected color.*

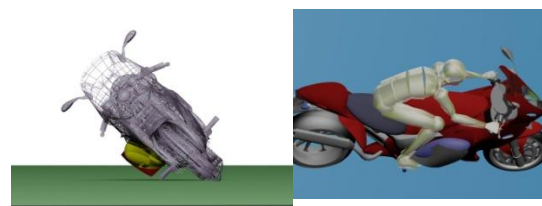
At the stage of design development quest color and graphic design solutions not only premature, but, as experience has shown, organized stream of thought, directing the creative energy.

***Component Analysis of concept design.***

Periodically examine the anthropometric standards implemented in three-dimensional model, limiting angles when turning.

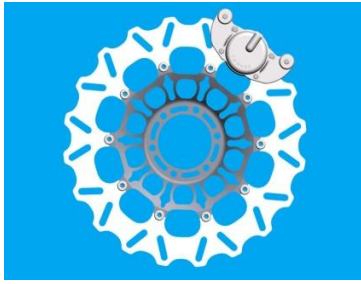


*Ill. 6. Antropometricheskaya scheme.*

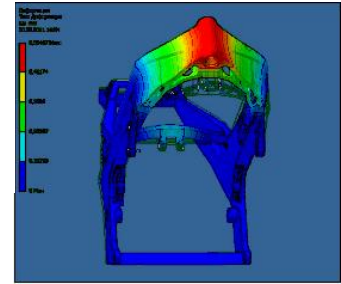


*Ill. 7. Limit angles.*

Designed and defined style. Light delicate wheels, petal brake discs with improved refinement of the design decisions and contrasted with the housing closed.

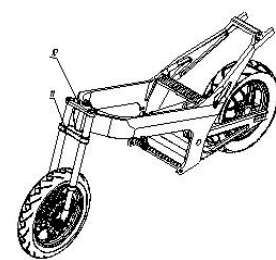
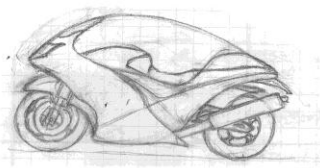


Ill. 8. Design motorcycle wheels.



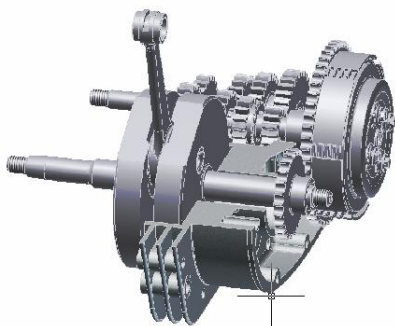
Ill. 9. Strength analysis of the frame.

High-strength steel frame, provides the necessary strength and stiffness characteristics created using finite element analysis.



Ill. 10. Sketch - search three-dimensional model - drawing.

Compact layout engine allows to minimize the distance between the driver's footrest. Besides the external effect is the increase in length of the swingarm and reducing the wheelbase. Small windshield of darkened acrylic 4-millimeter glass, ensuring expansion of the zone of visibility, comfortable saddle, increasing the ride height; seat space, emphasizing the dynamics of a motorcycle, the long pendulum and low center of gravity to attract the attention of a motorcycle. The transition of the fuel tank of a motorcycle in the saddle comfortable and logical. Balance of form and color modern motorcycle. 3-D modeling allows you to create complex models of components and assemblies.



Ill. 11. Model powertrain



Ill. 12. Model motorcycle traffic and traffic situations.

Using animation to evaluate the motorcycle in motion to create a presentation of the project.

**Conclusions:**

1. Simultaneous application of engineering and design approaches to the design provides qualitatively new and interesting results.

2. Lack of formal art education engineers can compensate by using a special technique, which develops three-dimensional thinking, acceptable in the art engineering and design engineering.

3. Jobs in software modeling 3-D environment allows you to create complex models: vehicles, their components and assemblies; traffic and road conditions, which will operate the vehicles, to simulate different traffic situations show the trajectory of the vehicle.

**Prospects for further research.** Application of computer simulation in plastic surround design creativity, figurative art thinking is the basis of the synthesis of engineering and artistic approaches in creating three-dimensional models.

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### Аннотация

*Шилов А.И., Думбур А.Е., Крикун А.А., Интеграция инженерного и художественного подходов в процессе проектирования. В статье рассмотрены проблемы проектирования новых транспортных средств, связанные с необходимостью совмещения инженерного и художественного подходов на примере проекта мотоцикла, необходимость интеграции инженерного и художественного подходов с применением современных компьютерных технологий.*

Ключевые слова: дизайн, мотоцикл, 3-D модель, объемно-пластинчатая трансформация, пропорционирование, ритмизация, колористическое и графическое решения.

#### Анотація

**Шилов А.І., Думбур А.Є., Крикун А.А., Інтеграція інженерного та художнього підходів у процесі проектування.** У статті розглянуті проблеми проектування нових транспортних засобів, пов'язані з необхідністю поєднання інженерного і художнього підходів на прикладі проекту мотоцикла, необхідність інтеграції інженерного і художнього підходів із застосуванням сучасних комп'ютерних технологій.

Ключові слова: дизайн, мотоцикл, 3-D модель, об'ємно-пластинчаста трансформація, пропорціональність, ритмування, колористичне і графічне рішення.