

SCOPE ACADEMIC HOUSE

11<sup>th</sup> International Conference  
«SCIENCE AND PRACTICE: A NEW LEVEL OF INTEGRATION  
IN THE MODERN WORLD»

November 30, 2020, Sheffield, UK

Conference Proceedings



SCOPE ACADEMIC HOUSE

B&M PUBLISHING

11<sup>th</sup> International Conference  
«SCIENCE AND PRACTICE: A NEW LEVEL OF INTEGRATION  
IN THE MODERN WORLD»

September, 10 - November, 30, 2020, Sheffield, UK

Conference Proceedings

Scope Academic House  
UK, S Yorkshire, Sheffield

B&M Publishing  
USA, San Francisco, California

SCOPE ACADEMIC HOUSE

B&M PUBLISHING

11<sup>th</sup> International Conference  
«SCIENCE AND PRACTICE: A NEW LEVEL OF INTEGRATION  
IN THE MODERN WORLD»

*Science editor: Prof. Robert Draut*

Copyright © 2020  
by Scope Academic House LTD  
Office 1 Velocity tower  
10 st. Mary's gate  
Sheffield  
S Yorkshire  
United Kingdom  
S1 4LR

ISBN 978-0-9898799-4-2

DOI: [http://doi.org/10.15350/UK\\_6/11](http://doi.org/10.15350/UK_6/11)

All rights reserved.

Published by B&M Publishing.  
For permission to use material from this  
text, please contact the publisher at  
2076 – 16th Ave., Suite A,  
San Francisco, California, USA 94116,

<i>B.S. Kurbanov, B.B. Samadov</i> PROTECTION OF INFORMATION SYSTEMS.....	77
<i>X.U. Xayatov, M.Sh. Muxsinova</i> DATA PROTECTION IN DISTRIBUTED INFORMATION SYSTEMS.....	79
<i>F.F. Norova</i> RELATIONSHIP OF DIFFERENT DISCIPLINES WITH INFORMATICS.....	81
<i>J.J. Atamuradov</i> PRINCIPLES OF CONSTRUCTION OF EFFECTIVE INFORMATION SYSTEMS.....	83
<i>G.B. Muradova, Sh.J. Shomurodov</i> MODELS OF BUSINESS SERVICE IN THE CLOUD SERVICE.....	85
<i>A.A. Abduaxodov, F.D. Xolmurodova, K. Yu. Sadullayeva</i> KEY BENEFITS OF USING AN ELECTRONIC DIGITAL SIGNATURE.....	88
<i>G.Sh. Fattoyeva, Sh.J. Shomurodov</i> METHODOLOGY FOR DETERMINING MATHEMATICAL CONCEPTS.....	90
<i>M.A. Qudratova</i> TYPES OF THEORIES AND METHODS OF THEIR PROOF.....	92
<i>J. Jumayev, G.M. Usmanova, Sh.B. Baxshilloev</i> COMPUTER SIMULATION OF THE CONVECTION PROCESS BETWEEN TWO VERTICALLY LOCATED HEAT SOURCES.....	94
<i>Z.Z. Shirinov, Sh.Sh. Suvonova</i> METHODS FOR INFORMATION EXCHANGE CONTROL IN COMPUTER NETWORKS....	97
<i>B.N. Taxiroy, A.A. Xakimov</i> MATLAB SYSTEM.....	99
<i>G.K. Zaripova, Sh.Sh. Baxronova, M.M. Muxammedova</i> THE ROLE OF THEORY AND APPLICATION OF INFORMATION SYSTEMS IN THE FIELD OF INFORMATION TECHNOLOGY.....	101
<i>N.S. Sayidova, Z.B. Xo'jamqulova</i> PROBLEMS OF INFORMATION SECURITY.....	103
<i>N.H. Ergashev, M. Nekboyev</i> MODERN EDUCATIONAL TECHNOLOGIES AS A GUARANTEE OF THE QUALITY OF THE EDUCATIONAL PROCESS.....	105
<i>Z. Makovozova</i> GEOTOURISM POTENTIAL OF NORTH OSSETIA-ALANIA.....	107
<i>R. Durov, E. Varnakova, N. Kobzeva</i> STRATEGIES FOR THE PREVENTION OF CARDIOVASCULAR DISEASES.....	109
<i>U. Makhmudxodjayeva</i> SPECIFIC ASPECTS CONCLUSION OF PAID SERVICE CONTRACTS WITH THE PARTICIPATION OF THE INTERNAL AFFAIR ORGANS.....	112

Research Article

**COMPUTER SIMULATION OF THE CONVECTION PROCESS BETWEEN  
TWO VERTICALLY LOCATED HEAT SOURCES**

J. Jumayev<sup>1</sup>  
G.M. Usmanova<sup>2</sup>  
Sh.B. Baxshilloev<sup>2</sup>

<sup>1</sup>Dotsent of the department of “Applied Mathematics and Programming Technologies”,  
Bukhara state university, Uzbekistan.

<sup>2</sup>Undegraduate, Bukhara state university, Uzbekistan.

<sup>3</sup> Undegraduate, Bukhara state university, Uzbekistan.

DOI: [http://doi.org/10.15350/UK\\_6/11.44](http://doi.org/10.15350/UK_6/11.44)

Abstract

This article simulates the process of the formation of dynamic and temperature boundary layers between two vertically located rods, which are heat sources. The formulated system of partial differential equations with boundary conditions is solved numerically and its algorithm is implemented using the DELPHI graphical environment. Chart component was used to draw graphs.

*Key words.* Dynamic boundary layer, temperature boundary layer, heat source, mathematical model, heat transfer, natural convection, boundary layer equations, laminar regime.

In [1], laminar convective transport near a vertically located heat source was studied. In this work, we numerically investigate a stationary, laminar transport in an adjacent layer immersed in a resting ambient gas between two vertical surfaces.

It is assumed that the ambient temperature is constant and equal  $t_0$ ; the temperature on the surface of the rods is also maintained at constant temperatures equal  $t_1, t_2$  ( $t_1 > t_0, t_2 > t_0$ ).

The considered physical process is mathematically modeled on the basis of the boundary layer approximation equation by the following system of differential equations:

$$\left. \begin{aligned} \frac{\partial}{\partial x}(\rho u) + \frac{\partial}{\partial y}(\rho v) &= 0, \\ \rho u \frac{\partial u}{\partial x} + \rho v \frac{\partial u}{\partial y} &= \frac{\partial}{\partial y} \left( \mu \cdot \frac{\partial u}{\partial y} \right) + \frac{\rho \beta (T - T_1)}{Fr}, \\ \rho u \frac{\partial E}{\partial x} + \rho v \frac{\partial E}{\partial y} &= \frac{1}{Pr} \frac{\partial}{\partial y} \left( \mu \cdot \frac{\partial E}{\partial y} \right). \end{aligned} \right\} (1)$$

In these equations, the unknown are:  $u, v$  - longitudinal and transverse components of the velocity;  $\rho$  - density,  $T$  - absolute temperature,  $E$  - total energy, as well as dynamic coefficient of viscosity.  $Fr$  - hydrodynamic Froude number,  $Pr$  - Prandtl number.

To close the system of differential equations (1), we supplement it with the algebraic

equation of total energy, the equation of state. The dependence of the gas viscosity coefficient on temperature is represented by the Sahterland formula [2].

Let us formulate the boundary conditions in the following form:

$$\left. \begin{array}{l}
 x = 0: \left\{ \begin{array}{ll} u = 0, v = 0, E = E_1, \rho = \rho_1 & \text{npu } y = 0 \\ u = 0, v = 0, E = E_0, \rho = \rho_0 & \text{npu } 0 < y < a \\ u = 0, v = 0, E = E_2, \rho = \rho_2 & \text{npu } y = a \end{array} \right. \\
 x > 0: \left\{ \begin{array}{ll} u = 0, v = 0, E = E_1, \rho = \rho_1 & \text{npu } y = 0 \\ u = 0, v = 0, E = E_2, \rho = \rho_2 & \text{npu } y = a \end{array} \right.
 \end{array} \right\} \quad (2)$$

Schematic flow pattern according to (1) is shown in fig.1.

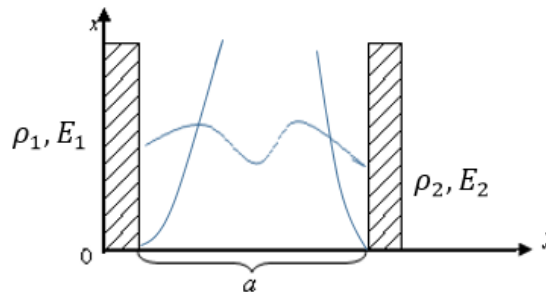


Fig. 1. Schematic flow pattern according to (1).

The above problem is solved numerically using a two-layer, four-point implicit finite-difference scheme and the iteration sweep method.

At the same time, on the basis of the compiled algorithm, a program in the DELPHI language was compiled. During the work of the program, the results were expressed in the form of graphs, for this we used the Chart component.

Figure 1. the appearance of axial velocity and expansion of the dynamic boundary layer at  $Pr = 0.7$  are shown. As can be seen from the figure, the higher along the rod, the higher the speed. Air temperature 300K.

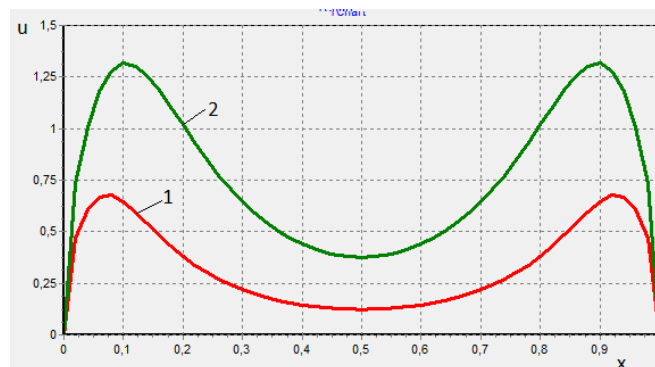


Fig. 1. The emergence of air velocity near heat sources, which have temperatures of 500K, respectively. 1-for  $\bar{x} = 5$ , 2-for  $\bar{x} = 10$ .

Figure 2. the appearance of axial velocity and expansion of the dynamic boundary layer at different temperatures of heat sources are given.

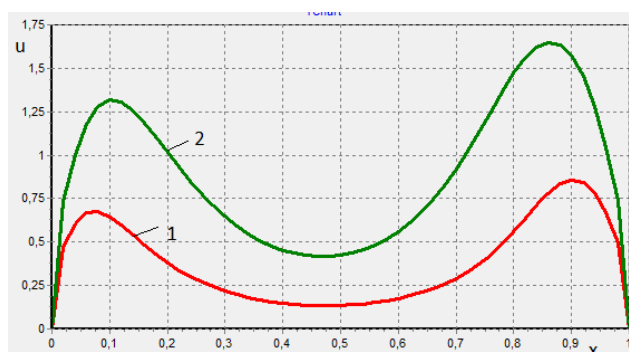


Fig. 2. The emergence of speed near heat sources, which have temperatures of 500K and 800K, respectively. 1-for  $\bar{x} = 5$ , 2-for  $\bar{x} = 10$ .

As can be seen from the figures, the higher the temperature of the source, the higher the air velocity near it. This is consistent with the physics of flow.

#### References

- Jumayev J., Shirinov Z., Kuldashv H. Computer simulation of the convection process near a vertically located source. //International conference on information Science and Communications Technologies (ICISCT) 4-6 november. 2019. Tashkent. // <https://ieeexplore.ieee.org/document/9012046/>
- Narziyev M.S., Jumayev J., Habibov F. Yu. Mathematical modeling of droplet fragmentation in mass transfer processes. //Scientific reports of Bukhara State University, 2/2020, p. 8-13.
- Жалолов О.И., Хаятов Х.У. Понятие SQL и реляционной базы данных // Universum: технические науки : электрон. научн. журн. 2020. № 6 (75).