Then we introduce the mapping $\Phi$ that maps the velocity field of rotation of particles. The fields $u$ and $\omega$ are defined in the appropriate coordinates $(x, y, z)$, and after writing the micropolar equations in the appropriate coordinates $(x, y, z)$, we believe that the obtained model can improve the properties of various devices such as air conditioners, refrigeration systems, central heating systems, and so on.

We present the asymptotic approximation for the velocity in the following form:

$$V(x) = \frac{3}{2} u(x) + \frac{1}{2} \omega(x) \times \mathbf{r} + \epsilon \left[ \mathbf{f}(x) + \mu \mathbf{g}(x) \right] + \epsilon^2 \left[ \mathbf{j}(x) + \mu^2 \mathbf{h}(x) \right] + \cdots$$

where $\mathbf{f}(x)$ is the external force acting on the fluid, $\mu$ is the magnetic field, and $\epsilon$ is a small parameter. By taking into account the effects of the magnetic field, we obtain the following estimates:

$$|Q(x)| \leq \frac{C_1}{\epsilon} \left( |\omega(x)| + |\mathbf{r}| + |\mathbf{j}(x)| + |\mathbf{h}(x)| \right),$$

where $C_1$ is a constant. The asymptotic solution $\mathbf{Q}(x)$ has the following form:

$$\mathbf{Q}(x) = \mathbf{f}(x) + \epsilon \mathbf{g}(x) + \epsilon^2 \mathbf{h}(x) + \cdots.$$

Finally, we obtain the asymptotic approximation for the fluid's properties in the following form:

$$\rho(x) \approx \rho_0 + \epsilon \rho_1 + \epsilon^2 \rho_2 + \cdots,$$

where $\rho_0$ is the density of the fluid, and $\rho_1$ and $\rho_2$ are the first and second-order corrections, respectively.

References