Moscow State Social University

Valery A. Vinokurov

Account
of
The Condensation Theory.

The mathematical model for obtaining of point particles far-action from continuous medium near-action

Moscow
1994

From references about Vinokurov's previous work on mathematical foundations of electrodynamics:

"Results of V.A.Vinokurov is one of the greatest achievements of XX century mathematical physics that has principal value for modern phisical picture of the world."

From reference of academician A.N.Tikhonov.

"I must say I cannot follow your reasoning. ...I do not see where you depart from classical electromagnetism you start with."

From the letter of The French Academy of Science President Jacques Friedel to professor V.A.Vinokurov.

" ...it is spoken about development of new higher energies accelerator construction based on Vinokurov's discovery that is hundred times less in size and cost than those which exist now. Let you image an electron accelerator with radius only 30 centimeters near by modern 35-meters ones and a proton accelerator with 6 meters diameter near by kilometres giant with billions dollars price.How many pits and tunnels do not need to build,how many forces and energy will economize ... "

Literaturnaya Gazeta,June 18,1992.

" ... size increase of charged particles accelerator from metres in the beginning of the age to hundred metres in the middle of the age and tens kilometres in the end of the age may turn out to be not science triumph but accelerator technology degeneration. New discoveries can make giant constructions principally absurd. ... Alternative to proton accelerator with diametre about 30 kilometres and cost $10 billions is Professor Valery Vinokurov accelerator with 12 meters diameter and $10 millions cost."

Literaturnaya Gazeta,July 21,1993.

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Account of The Condensation Theory.

The book contains the first short account of new author's theory - the condensation theory. Particles, their interaction laws, characteristics and dynamics are obtained from ideal continuous medium, filling all space, by mathematical means in the book.

The book is destined for physicists, mathematicians, specialists in continuous medium mechanics, engineers, using electrodynamics laws, and also for wide circle of readers, interested in modern science basics.

The book is published in author edition.

Contents

Author preface

This book is English translation of the book [4],published in Russia in 1993.It contains the first short sketch of author's theory,the condensation theory,without mathematical calculations and proofs.I named the scheme for obtaining of point particles far--action from continuous medium near-action as "the condensation theory".Presented theory should be treated as mathematical electrodynamics.The author fully assumes responsibility for claimed results and methods,that is underlined by the first person speaking from.

Introduction

I consider infinite continuous medium and its disturbances i.e. solutions of its Euler equations that vanish in infinity. My problem is to study asymptotic structure of these disturbances for long distances from their centre and their asymptotic interaction in case,when distance between their centres is much more than their kernels diameter.I name these disturbances by particles.Particles dynamics description needs introduction of their mass as some characteristics calculated through state function. Moments of particles state function are introduced to describe particles interaction.These moments give charge, spin, dipole moment and other characteristics of a particle.

§1. Ideal medium and Maxwell medium

It is considered continuous medium, that fills all space $\mathbb{R}^3$, with Lagrange variables. So current coordinates of medium points is $\vec{X}(t,\vec{x})$ with rectangular Descartes coordinates. Here t is time, $\vec{x} \in \mathbb{R}^3$ is supporting state coordinates, i.e. coordinates that we use to numerate medium points. It is introduced the action for time interval $[a,b]$ and space volume V. The action is integral functional of the following kind

$$L = \int_a^b \iiint_V \mathcal{L}\, dx_1 dx_2 dx_3\; dt.$$

Here $\mathcal{L} = \mathcal{L}(t,\vec{x},\vec{X}, \frac{\partial\vec{X}}{\partial\vec{x}}, \frac{\partial\vec{X}}{\partial t}, \ldots)$ is a function of t, $\vec{x}$, $\vec{X}$ and partial derivatives from function $\vec{X}(t,\vec{x})$. Function $\mathcal{L}$ is named *Lagrange function density* or *lagrangian*. I name such functions $\vec{X}(t,\vec{x})$, for which action variation turns into zero, by *extremals*. I assume that physical states of medium are extremals.

Further I narrow class of considered models and pass to consideration of the ideal medium, answering three axioms:

I. Lagrangian $\mathcal{L}$ is sufficiently smooth numerical function $\mathcal{L} = \mathcal{L}(t,\vec{x},\vec{X}, \frac{\partial\vec{X}}{\partial\vec{x}}, \frac{\partial\vec{X}}{\partial t})$ of $1+3+3+9+3=19$ numerical arguments.

II. Medium is stationary.

III. Action value does not change with own medium movements.

Using Lie group technique from work [1], it is obtained general form of lagrangian $\mathcal{L}(t,\vec{x},\vec{X}, \frac{\partial\vec{X}}{\partial\vec{x}}, \frac{\partial\vec{X}}{\partial t})$

of ideal medium in form $\mathcal{L}=\varphi(g(\frac{\partial\vec{X}}{\partial\vec{x}}, \frac{\partial\vec{X}}{\partial t}))$. Here φ is arbitrary function of 6 variables and $g\equiv(g_1, g_2, g_3, g_4, g_5, g_6)$ is 6 concrete polynoms of varibles $\frac{\partial\vec{X}}{\partial\vec{x}}$ and $\frac{\partial\vec{X}}{\partial t}$.

Ideal medium is, generally speaking, nonlinear. I approximate initial nonlinear medium with linear mediums (mediums with linear Euler equation) by approximating its lagrangian with quadratic lagrangians in the supporting state neighbourhood. If $\vec{X}_0\equiv\vec{x}$ is the supporting state, then quadratic with $\vec{U}(t,\vec{x})\equiv\vec{X}(t,\vec{x})-\vec{x}$ approximation to functional $L(\vec{X})-L(\vec{X}_0)$ is

$$L_{ts}(\vec{U}) = \int_a^b \iiint_V \mathcal{L}_{ts}\left[\frac{\partial\vec{U}}{\partial\vec{x}}, \frac{\partial\vec{U}}{\partial t}\right] dx_1dx_2dx_3\, dt.$$

Here lagrangian

$$\mathcal{L}_{ts}\left[\frac{\partial\vec{U}}{\partial\vec{x}}, \frac{\partial\vec{U}}{\partial t}\right] = \frac{\rho}{2}\left[\frac{\partial\vec{U}}{\partial t}\right]^2 - \left[(\mu+\nu)div\vec{U} + \frac{\mu}{2}\sum_{\alpha,\beta=1}^{3}\left[\frac{\partial U_\alpha}{\partial x_\beta}\right]^2 + \right.$$
$$\left. + \frac{\chi}{2}(div\vec{U})^2 + \frac{\nu}{2}\sum_{\alpha,\beta=1}^{3}\left[\frac{\partial U_\alpha}{\partial x_\alpha}\frac{\partial U_\beta}{\partial x_\beta} - \frac{\partial U_\beta}{\partial x_\alpha}\frac{\partial U_\alpha}{\partial x_\beta}\right]\right]$$

is set with four constants: medium density ρ and elastic constants μ, ν, χ. Further I assume that the linear medium Euler equations coinside with Maxwell equations system of electromagnetic field. I get limitations for constants: $\nu=-\mu$, $\chi=-\mu$. I introduce new variables to shorten further-following calculations. I introduce constant $c\equiv\sqrt{\mu/\rho}$, and value $x_0\equiv ct$, norm action with μ and get the following lagrangian

$$\mathcal{M}\left[\frac{\partial\vec{U}}{\partial\vec{x}}, \frac{\partial\vec{U}}{\partial x_0}\right] = \frac{1}{2}\left[\left[\frac{\partial\vec{U}}{\partial x_0}\right]^2 - (\,rot\vec{U}\,)^2\right] +$$
$$+ \sum_{\alpha,\beta=1}^{3}\frac{\partial U_\alpha}{\partial x_\alpha}\frac{\partial U_\beta}{\partial x_\beta} - \frac{\partial U_\beta}{\partial x_\alpha}\frac{\partial U_\alpha}{\partial x_\beta},$$

that I name *Maxwell lagrangian.* I name corresponding action by *Maxwell action* and corresponding medium by *Maxwell medium.*

I do two simplifying steps before Maxwell medium detailed study. At first I inroduce shortened Maxwell lagrangian

$$M\Delta\left[\frac{\partial\vec{U}}{\partial\vec{x}},\ \frac{\partial\vec{U}}{\partial x_0} \right] \equiv \frac{1}{2}\left[\left(\frac{\partial\vec{U}}{\partial x_0}\right)^2 - (\ rot\vec{U}\ )^2 \right]$$

and show that Maxwell action and shortened Maxwell action coinside for action, cosidered in all space $\mathbb{R}^3$, and for functions $\vec{U}(t,\vec{x})$, meeting decrease condition at space infinity of kind $|\vec{U}(x_0,\vec{x})| = \underline{O}\left(\frac{1}{|\vec{x}|}\right)$. So Maxwell action extremals study is reduced to shortened Maxwell action extremals study. At second I introduce operator variables change $\vec{U}=Bu$, i. e. I express 3-vector-function $\vec{U}(x_0,\vec{x})$, through new 4-vector-function $u(x_0,\vec{x})$ by formula

$$\vec{U}(x_0,\vec{x}) = \vec{u}(x_0,\vec{x}) - grad \int_{c_0}^{x_0} u_0(x_0,\vec{x})dx_0$$

and check that

$$M\Delta(Bu) = N(u),$$

Here $N\left[\frac{\partial u}{\partial x} \right]$ - is *Lorentz lagrangian*

$$N\left[\frac{\partial u}{\partial x} \right] \equiv \frac{1}{2} \sum_{i,j=0}^{3} \left[-\theta^{rl}\theta_{ij} + \theta_j^{\ r}\theta_i^{\ l} \right]\frac{\partial u_r}{\partial x_i} \frac{\partial u_l}{\partial x_j},$$

and

$$(1) \qquad \theta^i_j \equiv \theta^{ij} \equiv \theta_{ij} \equiv \begin{cases} 0, & i\neq j; \\ 1, & i=j=0; \\ -1, & i=j\neq 0. \end{cases}$$

Study of Maxwell action $M(\vec{U})$ is reduced by this way to study of Lorentz action $N(u)$.

Approximation of ideal medium action $L(\vec{X})$ with Lorentz action $N(u)$ is got as the result of executed constructions. Here $\vec{X}=\vec{U}+\vec{X}_0$, $\vec{U}=Bu$, $\vec{X}_0\equiv\vec{x}$. The approximation has the form

$$L\left[\vec{U}+\vec{X}_0 \right] - L\left[\vec{X}_0 \right] = \frac{\mu}{c} N(u)+W,$$

where

$$N(u) = \int_{ca}^{cb} \iiint_{\mathbb{R}^3} N\left[\frac{\partial u}{\partial x} \right] dx_1 dx_2 dx_3 dx_0 \tag{2}$$

is a quadratic functional and W is a functional of third degree degrease by u while $u\to0$. ($x\equiv(x_0,x_1,x_2,x_3)$ here and further in this text.)

So study of general action functional $L(\vec{X})$ is reduced to study of quadratic action functional $N(u)$ with error of third degree decrease by displasements for sufficiently little displasements.

§2. Invariant properties of Lorentz action

Lorentz action of kind

$$N(u) = \int_{-\infty}^{\infty} \iiint_{\mathbb{R}^3} N\left[\frac{\partial u}{\partial x} \right] dx_1 dx_2 dx_3 dx_0 \tag{3}$$

lets 10-parametre group of transformations of form

$$T_p(u) \equiv G^{\mathrm{T}}u(G(x-a)), \qquad G \in \Omega(\Theta), \quad a \in \mathbb{R}^4,$$

that transforms functions $u(x)$, diminishing in space infinity, to functions, diminishing in space infinity and retains unchanged value of functional (3). Here it is used the following notations: $\Omega(\Theta)$ is a set of all real number matrices G dimentions 4×4, those meet the condition

$$G^{T}\Theta G=\Theta$$

with matrix Θ of kind *(1)*; p is an element of Poincare group of transformations $\mathbb{R}^4$, that is given by matrix $G=G(p)\in\Omega(\Theta)$ and vector $a=a(p)\in\mathbb{R}^4$. I.e. T_p transformations is linear representation of Poincare group P of $\mathbb{R}^4$ space transformations. Euler equations for Lorentz action $N(u)$ have form

$$Au=0, \tag{4}$$

where A is a linear differential operator of the second degree, that transforms 4-functions $u(x)$ into 4-functions $j(x)$ of kind

$$(Au)_r\equiv\sum_{i,j,l=0}^{3}\left[\,\theta^{rl}\theta_{ij}-\theta_j{}^{r}\theta_i{}^{l}\,\right]\frac{\partial^2 u_l}{\partial x_i\partial x_j},\qquad r\in\overline{0,3}. \tag{5}$$

I name operator A by *system basic aperator.*

Lorentz action extremales are solutions of Euler equations *(4)*, but do not correspond, generally speaking, medium physical states. 4-functions $u(x)$, corresponding to medium physical states, are such that 3-function $\vec{X}(t,\vec{x})$, built through displasement function $\vec{U}(x_0,\vec{x})=Bu$ is an extremal of initial action of ideal medium, but applying operator A to them, I get 4-function $j\equiv Au$, that, generaly speaking, is not equal to zero. I name 4-function $u(x)$ by *state 4-function (function)* and 4-function $j(x)$ by *current 4-function (function)* . It results from the form *(5)* of the basic operator A, that current function meets equation

$$\sum_{k=0}^{3}\frac{\partial j_k}{\partial x_k}(x)=0. \tag{6}$$

I name $j_0(x)$ component by *charge density* and $\vec{j}\equiv(j_1,j_2,j_3)$ 3-vector by *current density*. Then correlation *(6)* is interpreted as continuity equation or as *charge conservation law* in differential form.

Remark 1. *Electron charge is positive for given choice of basic operator and charge density.*

§3. Particle states

Let u is a state function and $j=Au$ is a corresponding current function. I shall subject state function u to transformation T_p and get $\tilde{u}\equiv T_p u$ new function. The question arises: how are corresponding current functions $j=Au$ and $\tilde{j}=A\tilde{u}$ related? It is turned out $\tilde{j}=T_p j$, where transformation T_p has form

$$[\ T_p j\ ](x) = G^{-1} j[\ G(x-a)\ ],$$

if Poincare transformation $p \in P$ is given by pair $G\in\Omega(\Theta)$ and $a \in \mathbb{R}^4$. Transformations $\{\ T_p\}_{p\ \in\ P}$ too form a group of transformations that is a linear representation of Poincare group P.

Let function $u(x)$ corresponds to some physical state of the ideal medium, i.e. $\vec{X}=Bu+\vec{x}$ is an extremal of ideal medium action L with accuracy up to norming of variables. Then function $\tilde{u}=T_p u$, generally speaking, does not correspond already to ideal medium physical states, as transformation T_p retains invariant of Lorentz action, but not, generally speaking, of ideal medium action. But, from the approximation point of view, displasement function $\vec{U}=B\tilde{u}$ remains sufficiently good approximation of some new physical state, because new current 4-function $\tilde{j}=A\tilde{u}=T_p j$ retains the same property of decrease in space infinity as initial current function j. So I name functions $T_p u$ by *corresponding* to *different particle physical states* when p runs through tied unit component P_e of Poincare group P.

I come to quasistationary description of particle, i.e. I assume that its different physical states are well described (and so are replaced in model) by states of kind

$$\tilde{u}=T_p\mathring{u}, \tag{7}$$

$p \in P_e$, and all particle evolution is reduced only to parameter p change in representation (7) as the function of time x_0. So particle dynamics is reduced to study of parameter $p \in P_e$ dependence from time x_0. I.e. I get dynamics of point on the tied unit component of Poincare group. Particle states are numerated by elements p of Poincare group. I name state, in which element p is equal to unit element e, by the *standard state.*

§4. Agvids

I narrow class of state functions $u(x)$ by the following way. Let function $u(x)$ is a 4-function of a 4-vector x, that is defined on $\mathbb{R}^4$. I.e. $u(x)$ is a mapping $u: \mathbb{R}^4 \to \mathbb{R}^4$. If a mapping $uf: \mathbb{R}^3 \to \mathbb{R}^4$ and a vector $\vec{l} \in \mathbb{R}^3$ exist such that

$$u(x) = uf(\vec{x}-\vec{l}x_0),$$

then I name mapping $u(x)$ by *agvidal* one. Further in this paragraph I consider only agvidal state functions and name related particles by agvidal ones. It is not difficult to see that an agvidal particle is a particle - wave, i.e. disturbance, spreading with constant velocity $\vec{l}$. Further I shall write an agvidal state function in form

$$u(x) = uf(\vec{x}-\vec{b}(x_0)),$$

where $\vec{b}(x_0)$ is a particle centre, defined by some way, for example a charge centre. With that $\frac{d}{dx_0}\vec{b}(x_0) = \vec{l}$ and it is assumed that function $uf(\vec{x})$ of three variables has a centre in zero. Analogical representation through function of three variables will be true and for a related current function

$$j(x) = jf(\vec{x}-\vec{b}(x_0)),$$

Everywhere further I denote transition from function of four arguments x_0, x_1, x_2, x_3 to related function of three arguments x_1, x_2, x_3 for agvidal functions by addition of letter f to function simbol.

Transformations rules for functions $u(x)$ and $j(x)$ give transformation rules for functions $uf(\vec{x})$ and $jf(\vec{x})$. What form have these last rules?

Let us introduce 4-vector $l \equiv \begin{bmatrix} 1 \\ \vec{l} \end{bmatrix}$ of particle velocity by adding of zero component to space velocity components. Poincare transformation at point $x \in \mathbb{R}^4$ will be written in form

$$p(x)=G(x-a), \qquad G \in \Omega_e(\Theta), \quad a \in \mathbb{R}^4,$$

where $\Omega_e(\Theta)$ is the tied unit component of Lorentz group. Every matrix $G \in \Omega_e(\Theta)$ can be written with help of vector $\vec{\beta} \in \mathbb{R}^3$, such that $|\vec{\beta}|<1$ and ortogonal matrix $Q \in SO(3)$ in form

(8) $$G = G_t G_s,$$

where G_t, G_s are real number matrices 4x4. Matrix

(9) $$G_s = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & & & \\ 0 & & Q & \\ 0 & & & \end{bmatrix}.$$

Matrix

(10)
$$G_t = \begin{bmatrix} \xi_0 & -\vec{\xi}^{\,T} \\ -\vec{\xi} & B \end{bmatrix},$$
where $\xi_0 = \frac{1}{\sqrt{1-\beta^2}}$, $\vec{\xi} = \frac{\vec{\beta}}{\sqrt{1-\beta^2}}$, $\beta \equiv |\vec{\beta}|$, and B is a matrix 3x3 with elements
$$b_{\psi\alpha} = \delta_{\psi\alpha} + \left[\frac{1}{\sqrt{1-\beta^2}} - 1 \right] \frac{\beta_\psi \beta_\alpha}{\beta^2}; \qquad \psi, \alpha \in \overline{1,3}.$$
I shall name representation *(8)* by left representation of Lorentz matrix G.

Let us introduce the matrix

(11)
$$R \equiv [\, E + \vec{1} \cdot \vec{\beta}^{\,T} \,] BQ$$
with determinant
$$det[\, R \,] = \langle 1, \xi \rangle \equiv \sum_{i=0}^{3} 1_i \xi_i .$$
If $\tilde{u} = T_p(u)$ и $\tilde{j} = T_p(j)$ then
$$\tilde{u} f(\vec{x}) = G^T u f(R\vec{x}),$$
$$\tilde{j} f(\vec{x}) = G^{-1} j f(R\vec{x}).$$
Velocity 4-vector is transformed by rule
$$\tilde{1} = \frac{1}{(G^{-1} 1)_0} G^{-1} 1.$$
It results from here that
$$\langle \xi, 1 \rangle^2 [\, 1 - \tilde{\vec{1}}^{\,2} \,] = 1 - \vec{1}^{\,2}$$

and, in particular, value $1-\vec{1}^{\,2}$ has the same sign in all particle states. So all particles break up into three classes:

1) *underlights* - while $1-\vec{1}^{\,2} > 0$,
2) *ligts* - while $1-\vec{1}^{\,2} = 0$,
3) *superlights* - while $1-\vec{1}^{\,2} < 0$.

I name state function $u(x)$ by *Lorentz one* if the condition is fulfilled

$$\frac{\partial u_0}{\partial x_0} - \left[\frac{\partial u_1}{\partial x_1} + \frac{\partial u_2}{\partial x_2} + \frac{\partial u_3}{\partial x_3} \right] = 0.$$

One-to-one relation between state functions $uf(\vec{x})$ and current functions $jf(\vec{x})$ takes place for Lorentz agvidal particles while meeting some regularity conditions.

In every state let us introduce a matrix 4x4 of form

$$D \equiv \begin{bmatrix} 1 & -\vec{l}^{\,T} \\ -\vec{l} & E_3 \end{bmatrix},$$

and a quasi-current function

$$jt \equiv Dj, \tag{12}$$

where $\vec{l}$ is particle velocity in this state, E_3 is a unit matrix 3x3. While state changing a quasi-current function is transformed by rules

$$j\tilde{t}f_0(\vec{x}) = det\,(R^{-1})\; jtf_0(R\vec{x}), \tag{13}$$

$$\overrightarrow{j\tilde{t}f}(\vec{x}) = R^{-1}\; jtf(R\vec{x}). \tag{14}$$

So densities of quasi-charge jtf_0 and 3-quasi-current $\overrightarrow{jtf}$ is transformed independently. Besides that if quasi-charge (3-quasi-current) density is equal to zero in one state then it is equal to zero in all states. So I introduce notion of a *kiperal particle*, that has quasi-charge density $jtf_0=0$, and a *scalar particle*, that has 3-quasi-current density $\overrightarrow{jtf}=0$.

Charge conservation law, that is fulfilled for every current function $j(x)$, gives for quasi-current 3-function $\overrightarrow{jtf}(\vec{x})$ the correlation

$$div\ \overrightarrow{jtf}(\vec{x}) = 0.$$

Existance of a *spine function* $\overrightarrow{sf}(\vec{x})$ follows from it such that

$$\overrightarrow{jtf}(\vec{x}) = rot\ \overrightarrow{sf}(\vec{x}).$$

The *charge* and the *spine* of particle are defined accordingly by formulas

$$e \equiv \iiint_{\mathbb{R}^3} j_0(x)\ dx_1 dx_2 dx_3,$$

$$\vec{S} \equiv \iiint_{\mathbb{R}^3} \vec{s}(x)\ dx_1 dx_2 dx_3.$$

Charge e of agvidal particle is constant for time and does not depand from particle state. Spin $\vec{S}$ of agvidal particle is constant for time, but depends from particle state.

Every nonlight agvidal particle is decomposed by the only way as sum of a scalar particle and a kiperal one.

Agvid condition for an underlight particle is equivalent to existence of the *rest state*, such that current 4-function $j(x)$ does not depand on time x_0.

Particle scalarity means that current function has form $j(x)=lj_0(x)$, where l is velocity 4-vector.

An underlight agvidal particle is kiperal if and only if its charge density is equal to zero $j_0(x)=0$ in a rest state.

Quasi-current function jt has such odd before current function j, that their time and space components transform independently while state change. However transformation from current function to quasi-current function has such vice, that matrix D in formula *(12)* is degenarated when $|\vec{l}|=1$ as $det(D) = 1-|\vec{l}|^2$, and value j is not expressed through value jt. So I introduce pseudo-current 4-function js, consisting from charge density $js_0 \equiv j_0$ and pseudo-current 3-vector $\vec{js} \equiv \vec{jt}$. Then

$$js = Aj,$$

where matrix

$$A = \begin{bmatrix} 1 & 0\,0\,0 \\ \vec{-1} & E_3 \end{bmatrix}$$

and

$$j = A^{-1} js,$$

where

$$A^{-1} = \begin{bmatrix} 1 & 0\,0\,0 \\ \vec{1} & E_3 \end{bmatrix} .$$

Pseudo-current function *jsf* is transformed already according to the rules

$$\tilde{jsf}_0(\vec{x}) = (det(R))\, jsf_0(R\vec{x}) + \langle \vec{\xi}, \overrightarrow{jsf}(R\vec{x}) \rangle,$$

$$\overrightarrow{\tilde{jsf}}(\vec{x}) = R^{-1}\, \overrightarrow{jsf}(R\vec{x}).$$

§5. Condensation procedure

So I introduced two approximations for sufficiently little disturbances of continuous medium:

1) initial action of ideal medium is approximated with quadratic Lorentz action;

2) medium physical states are approximated with help of state 4-functions of kind $T_p(u)$. Here u is a standard state 4-functions, p is an element of the tied unit component P_e of Poincare group.

Let u' and u'' are two state 4-functions, corresponding to two physical states of ideal medium. Then their sum $u'+u''$, generally speaking, does not cosrespond to physical state of ideal medium, because ideal medium action L is not quadratic, generally speaking. But Lorentz action N is quadratic and sum of its extremals is an extremal too. I take the following assumption of approximation - I assume that the sum

$$u = T_{p'}(u') + T_{p''}(u'') \tag{15}$$

gives approximation for an ideal medium extremal if parameters p', p'' are taken from extremality condition of Lorentz action $N(u)$.

Let us see Lorentz action (2). Internal integral upon space gives Lagrange function

$$n(u) \equiv \iiint_{\mathbb{R}^3} N\left[\frac{\partial u}{\partial x} \right] dx_1 dx_2 dx_3. \tag{16}$$

Let us introduce bilinear functional $ni(u',u'')$ of kind

$$ni(u',u'') = \iiint_{\mathbb{R}^3} (- \theta^{kl}\theta_{ij} + \theta^k_j\, \theta^l_i) \frac{\partial u'_k}{\partial x_i} \frac{\partial u''_l}{\partial x_j} \; dx_1 dx_2 dx_3. \tag{17}$$

It is true represantation for Lagrange function with help of functional (17):

$$n(u' + u'') = ni(u',u')/2 + ni(u',u'') + ni(u'',u'')/2.$$

I name the value

$$m(u) \equiv ni(u,u)/2 = n(u)$$

by *mass* of particle (system) with state function u. I.e. mass is value of Lagrange function (16) for this state. I name functional $ni(u',u'')$ by *interaction* functional.

Taking standard states of two particles u' and u'' and calculating Lagrange function $n(u)$ according (12, 13), I get Lagrange function

$$(18) \qquad n = m(x_0, p', u') + ni(x_0, p', p'', u', u'') + m(x_0, p'', u'')$$

as a function of elements p' and p'' from group P_e. Further I consider variational problem with fixed boundaries for particle centre vectors $\vec{b}'(x_0)$ and $\vec{b}''(x_0)$ and for the functional

$$L = \int_{ac}^{bc} (m(x_0, p') + ni(x_0, p', p'') + m(x_0, p''))dx_0.$$

Expressing particle velocities $\dfrac{d\vec{b}'(x_0)}{dx_0}$ and $\dfrac{d\vec{b}''(x_0)}{dx_0}$ through parameters p' , p'' accordingly, I come further to Euler equations system for built variational problem.

If a particle is agvidal its mass is equal to

$$m = m_0\sqrt{|\ 1 - \vec{l}^2|} \quad ,$$

where m_0 is constant, $\vec{l}$ is a vector of particle velocity.

Interaction functional

$$(19) \qquad ni(u'.u'') = nit(\ \vec{b}'' - \vec{b}')$$

for agvidal Lorentz particles, having some regularity properties of function $uf(\vec{x})$ behaviour ("natural" particles in my terms). Here $nit(\vec{y})$ is a function, given on $\mathbb{R}^3$, which Fourier transformation is

(20)

(*)

$$\hat{nit}(\vec{\eta}) = \Big[(\vec{\eta}^2 - \langle \vec{l'}, \vec{\eta} \rangle \langle \vec{l''}, \vec{\eta} \rangle) \langle \hat{jf'}(\vec{\eta}), \hat{jf''}(-\vec{\eta}) \rangle - -\langle \vec{l''} - \vec{l'}, \vec{\eta} \rangle^2 \hat{jf_0}(\vec{\eta}) \hat{jf''_0}(-\vec{\eta}) \Big] / \Big[(\vec{\eta}^2 - \langle \vec{l'}, \vec{\eta} \rangle^2) (\vec{\eta}^2 - \langle \vec{l''}, \vec{\eta} \rangle^2) \Big]$$

Here $\vec{l'}$, $\vec{l''}$ are particles velocities; $\hat{jf'}(\vec{\eta})$, $\hat{jf''}(\vec{\eta})$. - are Fourier transformations of current functions $jf'(\vec{x})$, $jf''(\vec{x})$.

If there are k interacting particles with state functions u^1, $u^2, \ldots,$ u^k then by analogous way I get Lagrange function

$$n = \sum_{i=1}^{k} m_i(x_0, p^i, u^i) + \sum_{1 \le i < j \le k} ni(x_0, p^i, p^j, u^i, u^j).$$

So Lagrange function getting for agvidal particles is reduced, in force of foresaid, to calculation of function $nit(\vec{y})$ for twin interactions of particles.

(*) Every formulas in the text, that is framed and marked by star, should be considered as an individual complete work, which author rigts belongs to the author Valery A. Vinokurov. All their records in any simbols on any materials should be deemed as translations if functional dependence and physical sencc are remained. The rights of the author extend too upon all derivate expressions obtained from them by mathematical operations. Use or reproduction these formulas is possible only with the author permission.

§6. Asymptotic description of particles and interactions

I name space area, where current function differs from zero essentially, by *particle kernel*. Considering particle field when distances from the centre is long in comparison with particle kernel dimensions, I approximate current function $jf(\vec{x})$ with a corresponding distribution with point support in zero. I name this distribution by *vlavin*. Particle approximation with vlavin is equivalent to approximation of its Fourier transformation $\hat{jf}(\vec{\eta})$ with Tailor polynom of corresponding degree with centre in zero.

I use the same device when calculating interaction function of two agvidal particles $nit(\vec{y})$. Namely I sibstitute in formula *(20)* instead of Fourier transformations of current functions $\hat{jf}'(\vec{\eta})$ and $\hat{jf}''(\vec{\eta})$ their Tailor polynoms $t_m(\hat{jf}')(\vec{\eta})$ and $t_k(\hat{jf}'')(\vec{\eta})$ with centre in zero. Got approximate distribution $nit_a(\vec{y})$ gives approximation of function $nit(\vec{y})$ for distances that is much longer than particle kernel sizes. Calculation of function $nit_a(\vec{y})$ is made by formula *(20)* with using the technique of variables change in distributions, that is produced in [2].

Every vlavin can be assembled from finite number of *elemantary vlavins*, namely, from such generalized particles for which Fourier transformation is homogeneous polynom of degree m, named by vlavin order. So I introduce a set of elementary vlavins, from which it is possible to get asymptotic approximation as particles fields - by summing elementary vlavin fields so their interactions - by summing twin interactions of elemantary vlavins. Fourier transformation of pseudocurrent function, that is twice differentiable in zero, can be written in form

$$\widehat{jsf}_0(\vec{\eta}) = e + i\langle\vec{d}, \vec{\eta}\rangle - \langle Q_V\vec{\eta}, \vec{\eta}\rangle + o(\vec{\eta}^2)$$

$$\overrightarrow{\widehat{jsf}}(\vec{\eta}) = i\ [\vec{S},\vec{\eta}] - [F\vec{\eta},\vec{\eta}] + o(\vec{\eta}^2),$$

where I name constants by the following way:
$e \in \mathbb{R}$ is a *charge*; $\vec{d} \in \mathbb{R}^3$ is a *dipole moment*; Q_V is a symmetric matrix 3×3 - a *quadr*; $\vec{S} \in \mathbb{R}^3$ is a *spin*; F is a matrix 3×3 which track is equal to zero - a *quin*. Values e, $\vec{d}$, Q_V, $\vec{S}$, F are particle characteristics, transforming by the following way when state changes:

$$\tilde{e} = e, \tag{21}$$

$$\tilde{\vec{S}} = \frac{1}{(det\,(R))^2} R^T\vec{S}, \tag{22}$$

$$\tilde{\vec{d}} = R^{-1}(\ \vec{d} + \frac{1}{det\,(R)}\ [\vec{\xi},\vec{S}])\ ), \tag{23}$$

$$\tilde{F} = \frac{1}{(det\,(R))^2} R^T F R^{-1T}, \tag{24}$$

$$\tilde{Q} = R^{-1}(Q_V + \frac{1}{2det\,(R)}\ (Sw\ (\vec{\xi})F + (Sw\ (\vec{\xi})F)^T))R^{-1T}. \tag{25}$$

Here R is a matrix of form (11); $\vec{\xi}$ is a vector, introduced in representation (10) of matrix G_t; $Sw(\vec{\xi})$ is an antisymmetric matrix of form

$$Sw(\vec{\xi}) = \begin{bmatrix} 0 & -\xi_3 & \xi_2 \\ \xi_3 & 0 & -\xi_1 \\ -\xi_2 & \xi_1 & 0 \end{bmatrix}. \tag{26}$$

I define elemantary vlavins so that everyone from them represents one from introduced particle characteristics. Vlavin name begins from the syllable "vla": vlascale, vladip, vlakiper, vlasarm, vlanur, vlamar.

Underlight particles characteristics, introduced before, such as charge, dipole moment, spin, quadr, quin - can have any meaning. The following three vlavins suffice to have approximation with second order error for any underlight agvidal particle:

1) *vlascale* - scalar vlavin, representating the charge e with $\hat{jf}_0(\vec{\eta}) = e$;

2) *vladip* - scalar vlavin, representing the dipole moment $\vec{d}$, with $\hat{jf}_0(\vec{\eta}) = i\langle \vec{d}\ ,\ \vec{\eta}\ \rangle$;

3) *vlakiper* - kiperal vlavin, representing the spin $\vec{S}$, with $\hat{j\vec{s}f}\ (\vec{\eta}) = i\ [\vec{S},\vec{\eta}]$.

Light and superlight particles characteristics can not already have arbitrary magnitude but meet certain additional limitations, resulting from finitity conditions for mass and energy. So let us pass to consideration of conservation laws.

§7. Conservation laws

I have untroduced action of ideal medium that lets, according to definition, 13 - parameter group of invariant transformations, generated by 3 - parameter group of translations of supporting state; 3 - parameter group of ortogonal rotations of supporting state; 3 - parameter group of translations of current state; 3 - parameter group of ortogonal rotations of current state; 1 - parameter group of translations in the time. Every 1 - parameter invariant transformation generates, according to Noether theorem of the variational calculus, local conservation law, worded in differential form as turning into zero of certain 4-divergence. So initial action of ideal medium has 13 independent local conservation laws, letting simple physical interpretation. If I want now to consider solutions those are little medium disturbances, vanishing in infinity, then I have to restrict a group of solution invariant transformation by the condition that a solution, vanishing in space infinity, stays a solution, vanishing in space infinity after transformation. This condition bans displasements of current state with a constant vector, coordinates rotations in support and current states and results a 7-parameter group of invariant transformations. Got 7 local conservation laws have simple physical sence: 3 laws of iumpulse conservation, 3 laws of moment conservation, 1 law of energy conservation.

When certain additional conditions, a local conservation law, written in differential form, generates a global conservation law of certain value, wording in the form of magnitude constancy of certain integral upon all space. Different local conservation laws can give the same global conservation laws with that.

I had approximated ideal medium action in displasements with Maxwell action, shortened Maxwell action, Lorentz action and then passed to condensed action. A 7-parameter group of invariant transformations is conserved with that for agvidal particles for all these actions with natural physical interpretation of corresponding conservation laws. The question arises: how do conservation laws of impulse, moment and energy correlate for all these five systems?

I state the following for the example of energy conservation law. The energy local conservation laws for ideal medium action, Maxwell action, shortened Maxwell action, Lorentz action are different all. The energy global conservation laws for Maxwell action and shortened Maxwell action coinside and are approximation of the energy global conservation law for ideal medium. The energy global conservation law for Lorentz action, the energy global conservation law for shortened Maxwell action and the energy conservation law for condensed action are different all. The global energy conservation law for Lorentz medium is not approximation of the global energy conservation law for ideal medium.

Further I name energy value for shortened Maxwell action by *physical energy*. Demand of physical energy finity for agvidal particle: 1) does not give additional limitations for particle characteristics in underlight case; 2) results turning into zero of charge $e = 0$, and spin $\vec{S} = 0$ and ortogonality of vectors of dipole moment $\vec{d}$ and velocity $\vec{l}$ in light case; 3) results equalities: $e = 0$, $\vec{d} = 0$, $\vec{S} = 0$ and special form of quin and quadr in superlight case.

I introduce a *vlasarm* for approximation of a light particle with finite physical energy. A vlasarm is a scalar vlavin with Fourier transformation of pseudocharge density

$$\hat{jsf}_0(\vec{\eta}) = i \langle \vec{d}, \vec{\eta} \rangle,$$

that represents "in pure form" one characteristic, namely dipole moment $\vec{d}$, and besides scalar product $\langle \vec{d}, \vec{l} \rangle = 0$. Transformation law for dipole moment with particle state change, namely formula (23), takes form in this case:

$$\vec{\tilde{d}} = R^{-1}\vec{d}.$$

I introduce new characteristics: *squadr* $c \in \mathbb{R}$ and *vequin* $\vec{h} \in \mathbb{R}^3$ for superlight particle of finite physical energy. Accordingly I introduce a *vlanur* and a *vlamar* for main order apporoximation of a superlight agvidal particle. Vlanur is a scalar superlight vlavin with Fourier transformation of pseudocharge density

$$\hat{jsf}_0(\vec{\eta}) = -\langle Q_V\vec{\eta}, \vec{\eta} \rangle,$$

where $Q_V = c\, K\Delta(\vec{l})$ and $K\Delta(\vec{l})$ - is a matrix 3×3 of form $K\Delta(\vec{l}) \equiv E_3 - \vec{l}\,\vec{l}^T$. Vlamar is a kiperal vlavin with Fourier transformation of pseudocurrent 3 - function

$$\hat{j\vec{s}f}(\vec{\eta}) = -[F\vec{\eta}, \vec{\eta}],$$

where matrix $F = Sw(\vec{h})\; K\Delta(\vec{l})$ is multiplication of matrix $K\Delta(\vec{l})$ and matrix (26). Transformation laws for squadr and vequin with particle state changing have form

$$\tilde{c} = c,$$

$$\vec{\tilde{h}} = \frac{1}{det\,(R)}\, R^{-1}\vec{h}.$$

§8. Scales and their interactions

It turns out that approximation of underlight agvidal particles with elementary vlavins of zero order, namely *vlascales*, suffices to get classical electrodynamics of charges and currents. A vlascale has Fourier transformation of current function

$$\hat{j}\vec{f}(\eta) = el,$$

where e is vlascale charge, l is vlascale velocity 4 - vector. Interaction functional for two vlascales is equal to

$$ni(u',u'') = e'e''\ vin(\vec{\beta}',\ \vec{\beta}'',\ \vec{b}'' - \vec{b}'),$$

according to (17,19,20), where $vin(\vec{\beta}',\ \vec{\beta}'',\ \vec{y})$ is the function of three vector arguments, presented in [3].

I introduce notion of a *scale*. A scale is an underlight scalar sphere - symmetric agvidal particle for which approximation of its interactions with other particles is ordered by a vlascale. So a system of two interacting scales is described with Lagrange function

$$(27)\qquad n = m'\sqrt{1 - (\vec{\beta}')^2} + e'e''\ vin(\vec{\beta}',\ \vec{\beta}'',\ \vec{b}'' - \vec{b}') + \\ + m''\sqrt{1 - (\vec{\beta}'')^2}.$$

Accordingly a system of k interacting scales is described with Lagrange function

$$(28)\qquad n = \sum_{i=1}^{k} m_i\sqrt{1 - (\vec{\beta}_i)^2} + \sum_{1\le i<j\le k} e_i\, e_j vin(\vec{\beta}_i,\ \vec{\beta}_j,\ \vec{b}_j - \vec{b}_i).$$

Going to limite with number of particles $k \longrightarrow \infty$, I get in limite a lagrangian for scale interaction with external field, generated by continuously distributed system of charges and currents.

Function $vin(\vec{\beta}',\ \vec{\beta}'',\ \vec{y})$ has the property that if velocity $\vec{\beta}'' = 0$, then function $vin(\vec{\beta}',\ 0,\ \vec{y}) = 1/(4\pi|\vec{y}|)$, i.e. it coincides with Cuolomb potential. So my theory gives description, coinciding with classical one for charge movement in electrostatic field.

Approximation of the function $vin(\vec{\beta}',\ \vec{\beta}'',\ \vec{y})$ with Tailor polynom of second order by arguments $\vec{\beta}'$, $\vec{\beta}''$ with zero centre gives the function

$$vis(\vec{\beta}',\ \vec{\beta}'',\ \vec{y}) = \frac{1}{4\pi|\vec{y}|}\left[1 - \langle\vec{\beta}',\ \vec{\beta}''\rangle + \frac{\langle[\vec{\beta}',\vec{y}],[\vec{\beta}'',\vec{y}]\rangle}{2|\vec{y}|^2}\right].$$

So second order approximation by velocities gives the following Lagrange function for a scale in external field, generated by stationary distribution of charges with density $j_0(\vec{x})$ and currents with density $\vec{j}(\vec{x})$,

$$(29)\qquad n_a = m(1 - \vec{\beta}^2/2) + e(\varphi - \langle\vec{\beta},\ \vec{A}\rangle),$$

here φ - is scalar , $\vec{A}$ - is vector potential of external field and

$$(30) \qquad \varphi(\vec{x}) = (1/4\pi) \iiint_{\mathbb{R}^3} \frac{j_0(\vec{y})}{|\vec{y} - \vec{x}|} dy_1 dy_2 dy_3 \ ,$$

$$(31) \qquad \vec{A}(\vec{x}) = (1/4\pi) \iiint_{\mathbb{R}^3} \frac{\vec{j}(\vec{y})}{|\vec{y} - \vec{x}|} dy_1 dy_2 dy_3 \ .$$

Formula (29) is obtained from Lagrange function (28) by going to limite with $k \longrightarrow \infty$. So classic relativistic Lagrange function, decribing charged particle movement in external field,

$$(32) \qquad n_c = m \sqrt{1 - (\vec{\beta})^2} + e(\varphi - \langle \vec{\beta}, \vec{A} \rangle)$$

is only second order approximation with velocities for the exact interaction law with my theory point of view. But description with help of Lagrange function (32) is exact in case $\vec{A} = 0$ (electrostatic field).

Scales dynamics differs from classical relativistic charge dynamics in general case what I shall demonstrate in two examples: in scale movement in constant magnetic field and in centrically symmetric movement of two scales with equal masses.

§9. Scale movement in magnetostatic field

Following terminology earlier introduced, I name field of a resting kiperal agvid by the magnetostatic field. Calculating interaction functional for a scale and a resting kiperal agvid according to formula (20), I get the following Lagrange function for a scale in field of a resting kiperal agvid

(33) $$n = m\sqrt{1-(\vec{\beta})^2} - e\,\langle\vec{\beta},\ \vec{A}\rangle,$$

where value $\vec{A} = \vec{A}(\vec{\beta},\ \vec{x})$ $\left[\vec{\beta} \equiv \frac{d\vec{x}}{dx_0}\right]$ is expressed through current 3-function $\vec{j}(x) = \vec{jf}(\vec{x})$ of a resting particle by the formula

(*)

$$\vec{A}(\vec{\beta},\vec{x}) = (1/4\pi)\iiint_{\mathbb{R}^3} \frac{j\vec{f}(\vec{y})}{\sqrt{(\vec{y}-\vec{x})^2 - [\vec{\beta},\ \vec{y}-\vec{x}]^2}}\, dy_1 dy_2 dy_3 .$$

If a solenoid, flowed around circle by constant density current, is taken as the second agvid, then analogous calculations give the following expession for Lagrange function (33)

(34) (*)

$$n = m\sqrt{1-\vec{\beta}^2} - e\,\frac{\langle\vec{\beta},\ [\vec{x},\ \vec{H}]\rangle}{1+\sqrt{1-\vec{\beta}_\perp^2}}$$

i.e.

$$A(\vec{\beta},\ \vec{x}) = \frac{[\vec{x},\ \vec{H}]}{1+\sqrt{1-(\vec{\beta}_\perp)^2}}$$

in this case, where $\vec{H}$ is magnetic field density inside solenoid, $\vec{\beta}_\perp$

is scale velocity projection on a plain, that is ortogonal vector $\vec{H}$. The coordinates centre is chosen on solenoid axis and axis x_3 is chosen along vector $\vec{H}$.

Spiral trajectories around solenoid axis exist among extremales of Lagrange function (33) such that absolute velocity value $\beta \equiv |\vec{\beta}|$ is constant on them. Radius of such spiral line

$$r = \frac{\beta_\perp m \sqrt{1 - (\beta_\perp)^2}}{e H \sqrt{1 - \beta^2}}$$

angular velocity of rotation

$$\omega = \frac{e H \sqrt{1 - \beta^2}}{m \sqrt{1 - (\beta_\perp)^2}} ,$$

where $\beta_\perp \equiv |\vec{\beta}_\perp|$. Nevertheless trajectories, not being spiral lines, exist too.

Trajectories of more complicated kind exist for particular case of plain movement with $\beta_\parallel = \beta_3 = 0$ too, except for circular trajectories with centre on the solenoid axis, for which absolute velocity value is not constant. And besides trajectories exist for which a particle enlarges its velocity up to light velocity for finite time.

Let us remark for comparison, that classical relativistic description of charged particle movement, that proceeds from Lagrange function (32), results Lagrange function of form (33), where value $\vec{A} = \vec{A}(0, \vec{x}) = \frac{1}{2} [\vec{x}, \vec{H}]$. With this a particle goes along spiral line with radius

$$r = \frac{\beta_{\perp} m}{e\, H \sqrt{1 - \beta^2}}$$

and constant angular velocity

$$\omega = \frac{e\, H \sqrt{1 - \beta^2}}{m}$$

for any initial data.

§10. Centrically symmetric movement of two scales with equal masses

Lagrange function (27) for case of a system of two scales with equal rest mass m_0 lets centrically symmetric movements with particles radius-vector $\vec{b}'' = -\vec{b}'$ and velocity vector $\vec{\beta}'' = -\vec{\beta}'$. Lagrange function is equal to the following expression in this case for polar coordinates (r, φ) in the movement plain

$$(35) \qquad sim = 2m_0\sqrt{1 - (\dot{r}^2 + r^2\dot{\varphi}^2)} +$$

$$+ \frac{e'e''}{8\pi}\,\frac{1}{r}\cdot\left[\,1 + \frac{\dot{r}^2}{1 - r^2\,\dot{\varphi}^2}\,\right]\cdot(1 - r^2\,\dot{\varphi}^2)^{-1/2},$$

where the point above simbol means differentiation by normed time x_0.

Lagrange function (35) lets rotation orbits with $r = const.$ Trajectory radius r, system moment $\mathcal{M}$, system energy $\mathcal{H}$ and system mass m_S depand from the absolute velocity value $\beta = |r\,\dot{\varphi}|$ on such circular trajectory by the following way:

$$r = \frac{e'e''}{16\pi m_0} \cdot \frac{2\beta^2 - 1}{\beta^2(1 - \beta^2)}; \tag{36}$$

$$\mathcal{M} = -\frac{e'e''}{8\pi} \cdot \frac{1}{\beta\sqrt{1 - \beta^2}}; \tag{37}$$

$$\mathcal{H} = 2m_0\sqrt{1 - \beta^2}; \tag{38}$$

$$m = 2m_0\frac{3\beta^2 - 1}{2\beta^2 - 1} \cdot \sqrt{1 - \beta^2}. \tag{39}$$

If charges have different sign $e'e'' < 0$, then it results from formula (36) that rotation solutions exist when

$\beta \in]0, \frac{1}{\sqrt{2}}[$. With this when velocity β varies from 0 to $\frac{1}{\sqrt{2}}$, then radius r varies from $+\infty$ to 0, moment $\mathcal{M}$ varies from $+\infty$ to $-\frac{e'e''}{4\pi}$, system energy $\mathcal{H}$ varies from $2m_0$ to $m_0\sqrt{2}$. System mass m_S varies from $2m_0$ to 0, when β varies from 0 to $\frac{1}{\sqrt{3}}$ and from 0 до $-\infty$, when β varies from $\frac{1}{\sqrt{3}}$ to $\frac{1}{\sqrt{2}}$.

If charges have the same sign $e'e'' > 0$, then it results from formula (36) that rotation solutions exist when

$\beta \in]\frac{1}{\sqrt{2}}, 1[$. With this when velocity β varies from $\frac{1}{\sqrt{2}}$ to 1, then radius r varies from 0 to $+\infty$, moment $\mathcal{M}$ varies from $-\frac{e'e''}{4\pi}$ to $-\infty$, energy $\mathcal{H}$ varies from $m_0\sqrt{2}$ to 0, system mass m_S varies from $+\infty$ до 0.

So two identic scales can create a stationary rotation system when movement velocities $\beta > \frac{1}{\sqrt{2}}$. So only electromagnetic forces suffice principally to keep identically charged particles in atom kernels.

Besides we see in this example how system, having zero or negative mass, can be built from underlight agvidal particles with positive rest mass.

§11. Application of considered scheme to other continuous mediums

Presented scheme for construction of point particles electrodynamics from properties of the ideal medium lets generation for constraction of point particles dynamics from properties of arbitary continuous medium on manifold in form of the following sequence of actions:

1) Initial action functional is approximated with quadratic action functional in neighbourhood of supporting state.

2) Linear operator variables change is made.

3) Group G of invariant transformations of the quadratic action in new variables is found.

4) Lagrange function, depanding on time t and element g of group G, is got by integration with respect to space variables.

5) Approximation of particle current function with point support distribution is used for approximative calculation of integral with respect to space variables.

Using Lagrange mechanics language, I have learned for given continuous medium to build particles and study properties of their fields and their interactions, to obtain particles dynamics as certain approximative asymptotic description of continuous medium. So the problem of obtaining particles far-action have solved as specialy for electrodynamics so and in sense of general scheme construction.

Literature

1. Винокуров В. А. Логарифм решения линейного дифференциального уравнения, формула Хаусдорфа и законы сохранения. - Dokl.Akad.Nauk SSSR, 319, N. 4, p. 792-797, (1991).
2. Винокуров В. А. Замена переменных и умножение обобщенных функций. - Dokl.Akad.Nauk SSSR, 319, N. 5, p. 1057-1064, (1991).
3. Винокуров В. А. Закон взаимодействия движущихся зарядов. - Gipoteza, N. 1, p. 24-36, (1993).
4. Винокуров В. А. Очерк теории конденсации. - Moscow: "SOJUZ" Publishing House, 1993.

Винокуров В.А. Очерк теории конденсации.
М.: издательство «Союз», 1994. ISBN 5-7139-0006-1.

Компьютерный набор и верстка С.И.Соловьевой

ЛР N 020658 от 12.10.92

Подписано в печать с оригинал-макета 28.10.94. Формат 60 x 84/16. Бумага офсетная. Печать офсетная. Уч.-изд. л. 1,6. Тираж 200 экз. Заказ 1364.

Издательство «Союз» МГСУ.
107150, г.Москва, ул.Лосиноостровская, 24.
Отпечатано в из-ве «Союз».