Towards
string field theory of tensionless strings
for
D=6 N=(2,0) CFT

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Main point of our work

N D-branes $\xrightarrow{\text{low energy}}$ Degrees of freedom(DOF):

NxN matrix field

Yang-Mills theory

This fact is deeply relevant for various proposals of matrix models and also for matrix geometry.

N M5-brane $\xrightarrow{\text{low energy}}$ named "D=6 N=(2,0) CFT"

no consensus on its formulation

Our work: This theory should be formulated as

a string field theory of tensionless strings

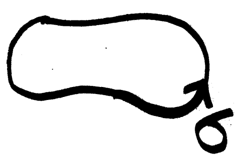
DOF: NxN matrix-valued closed string field

String field theory(SFT)

- String field theory is 2nd-quantised form. of string theory.

- 1st quantised version → 2nd quantised version

1st quantised version		2nd quantised version
theory of particles DOF: x^μ	$\longrightarrow$	field theory $\phi(x^\mu)$ defined on spacetime
theory of strings DOF: $x^\mu(\sigma)$	$\longrightarrow$	string field theory $\phi[x^\mu(\sigma)]$ defined on a loop space (=space of loops on spacetime)



- In the usual (tensile=”tensionful”) case, one can think of SFT as field theory with infinite number of fields (corresponding to the string spectrum).

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Our work: This theory should be formulated as
a string field theory of tensionless strings
DOF: NxN matrix-valued closed string field
=NxN matrix-valued field on a loop space
We constructed the theory partially
(=free part+cubic part.) using lightcone gauge

Introduction

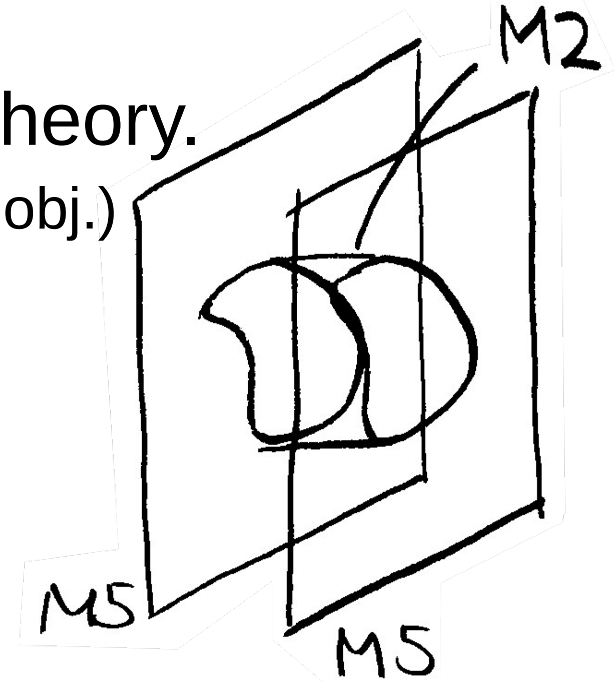
- M-theory
- M5 branes
- D=6 N=(2,0) theory

- <u>M-theory</u> '94 Hull-Townsend, Witten
- The strong coupling limit of IIA superstring theory becomes 11 dimensional (rather than 10 dimensional), with membrane (M2) DOF (rather than strings). with no tunable coupling const.

- M-theory plays an important role in non-perturbative aspects of string theory. Understanding of M-theory at the classical level (for BPS=SUSY-protected sector) allows understanding (or interpretation) of non-perturbative phenomena such as S-duality of IIB superstring theory.

- Understanding (computing) quantum properties of M-theory (for non-BPS observables) is an important direction. One needs a formulation of M-theory. There is a good candidate, the matrix model. '88 deWit-Hoppe-Nicolai; '96 BFSS
Establishing the model, solving problems like large N limit and Lorentz invariance, is important.

- M5 branes
- In this talk I focus on a special sector of M-theory.
- M-theory contains M5 branes(5 space + 1 time obj.) in addition to M2 branes
- M2 can end on M5.
  Analogous to strings vs D-branes.



- M5 are less understood compared to M2.

☆ The matrix model
  -contains M2. Matrices are regularised M2 '82 Goldstone;'82 Hoppe; '88 deWit-Hoppe-Nicolai
  -M5 NOT understood. Cf.Proposal for BMN matrix model
  cf. '02 Maldacena-SheikhJabbari-vanRaamsdonk '02 Berenstein-Maldacena-Nastase
  '17 Asano-Ishiki-Terashima-Shimasaki

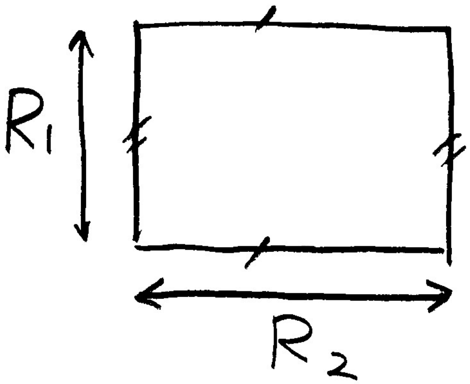
☆ Low energy effective theory of coincident branes
  (cf. D-branes and NxN matrix field theory YM)
  -for M2: NxN matrix-valued field theory
  (level k=1 CS + matter) '06 ABJM
  -for M5: named "D=6 N=(2,0) CFT" ⟵ We focus on this

- D=6 N=(2,0) CFT

Witten, Strominger '95

- The low energy theory for coincident M5 branes is conjectured to be a theory with conformal symmetry and N=(2,0) SUSY.

- Provides insights into properties of SUSY QFT's.



$$\frac{1}{g_{YM}^2} = \frac{R_2}{R_1} \text{ or } \frac{R_1}{R_2}$$

e.g. D=6 N=(2,0) CFT on $T^2 \times \mathbb{R}^4$ and S-duality of D=4 N=4 SYM

- BPS properties of the theory are studied extensively.

- No tunable coupling constants.
  The theory is inherently strongly coupled.

Different motivation for studying D=6 N=(2,0) CFT

Also interesting from general QFT point of view.

-Theory space of QFT is governed by the renormalisation group flow.
To understand the structure of the flow it is natural to start from fixed pts. → CFT

-D=5+1 is the largest dimension in which superconformal theory (CFT + SUSY) can exist (classification of superconformal algebra '78 Nahm).
D=6 N=(2,0) CFT is the superconformal field theory in highest space dimension and with largest supersymmetry.

-mere existence of D=6 CFT is interesting:
Simple power counting argument
→ dimensionless coupling constants in D=6 unlikely
(ϕ^3 theory is allowed but energy can become arbitraily negative.)

- Formulation of D=6 N=(2,0) CFT
- No consensus on (existence of) Lagrangian description.
  -What are the fundamental DOF?
  -Lagrangian?

- There are several proposals for a Lagrangian description. E. g.
  -matrix model type (low energy limit) Aharony-Berkooz-Seiberg'97
  -D=5 max.SYM Douglas;Lambert-Papageorgakis-SchmidtSommerfeld'10
  (de-compactification limit)

- The conformal bootstrap method Beem-Lemos-Rastelli-vanRees '15 is also interesting (including non-BPS) and do not rely on the existence of a Lagrangian.

- Lagrangian formulation is desirable for understanding the fundamental DOF and for studying non-BPS quantum properties of M5 branes.

- In this talk, I will discuss a new approach for the formulation of D=6 N=(2,0) CFT.
  - interacting theory of tensionless strings using lightcone(LC) string field theory(SFT)
  - We aim for
    a classical Lagrangian with correct symmetry
    (without taking any limit)
    N=(2,0) SUSY + scale inv (=dim less coupling).

- We think our work provides the first steps and necessary tools. I will show how far we got, and discuss some features of the proposal.

Outline

1. Main idea:
   SFT of tensionless strings with matrix-valued string field
   - tensionless strings from M2 between M5
   - Why SFT (i. e. why 2nd quantised formulation)?
   - Lightcone(LC) gauge
2. LC superstring field theory of
   the tensionless strings: How far we got
   - String field
   - Free part
   - Cubic part ansatz (fixed up to 2 parameters)
3. tensionless SFT and infamous difficulties in Lagrangian form.
   - Power counting and coupling const.
   - Reduction to D=4 N=4 SYM

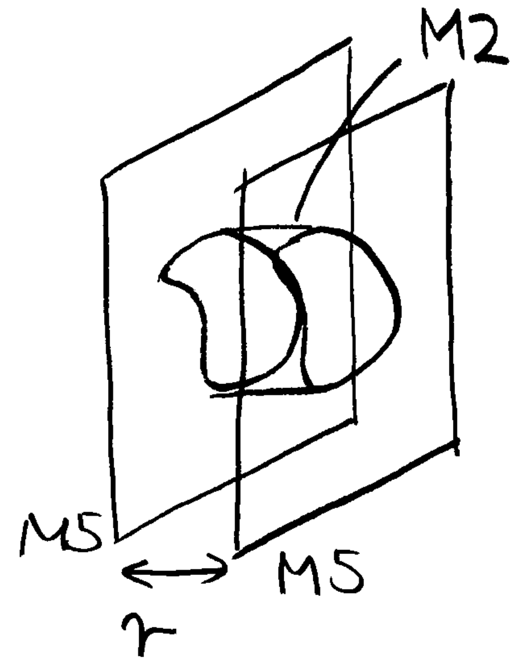
$$\frac{1}{g_{YM}^2} \sim \frac{R_2}{R_1}$$

4. Problems of observables
   - a hint from AdS7/CFT6 and large R-charge
   - a speculative idea : BMN-like operator on loop space

1. D=6 N=(2,0) CFT as
lightcone(LC) gauge SFT
for tensionless strings
with matrix-valued string field

- tensionless strings from M2 between M5
- the main idea
- Why SFT?
- use of Lightcone gauge

- <u>Tensionless strings and M5</u>



- Consider two pararell M5 branes with separation r and M2 between them

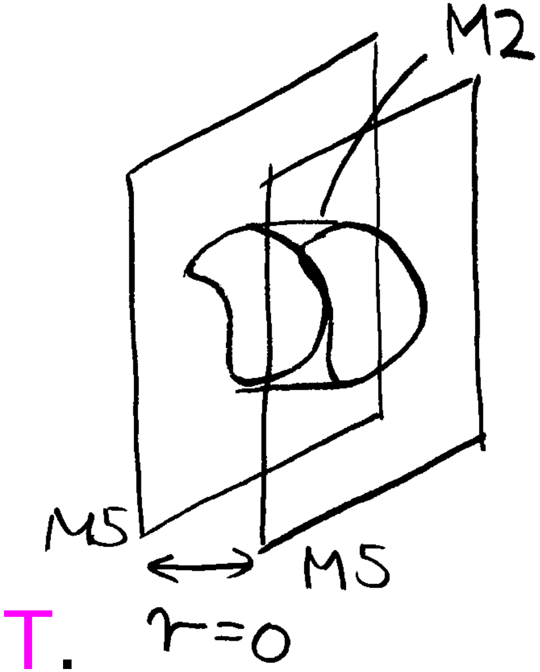
- When r is small compared with other length scales, the M2 would behave effectively as a string with the tension

$$(\text{tension}) = (\text{tension of M2}) \times r$$

- In the extreme case of coincident M5 branes (whose low energy theory is the D=6 N=(2,0)CFT) the strings will be tensionless

$$(\text{tension}) = 0$$

- D=6 N=(2,0) CFT contains
  tensionless strings
  =M2 stretching between M5.

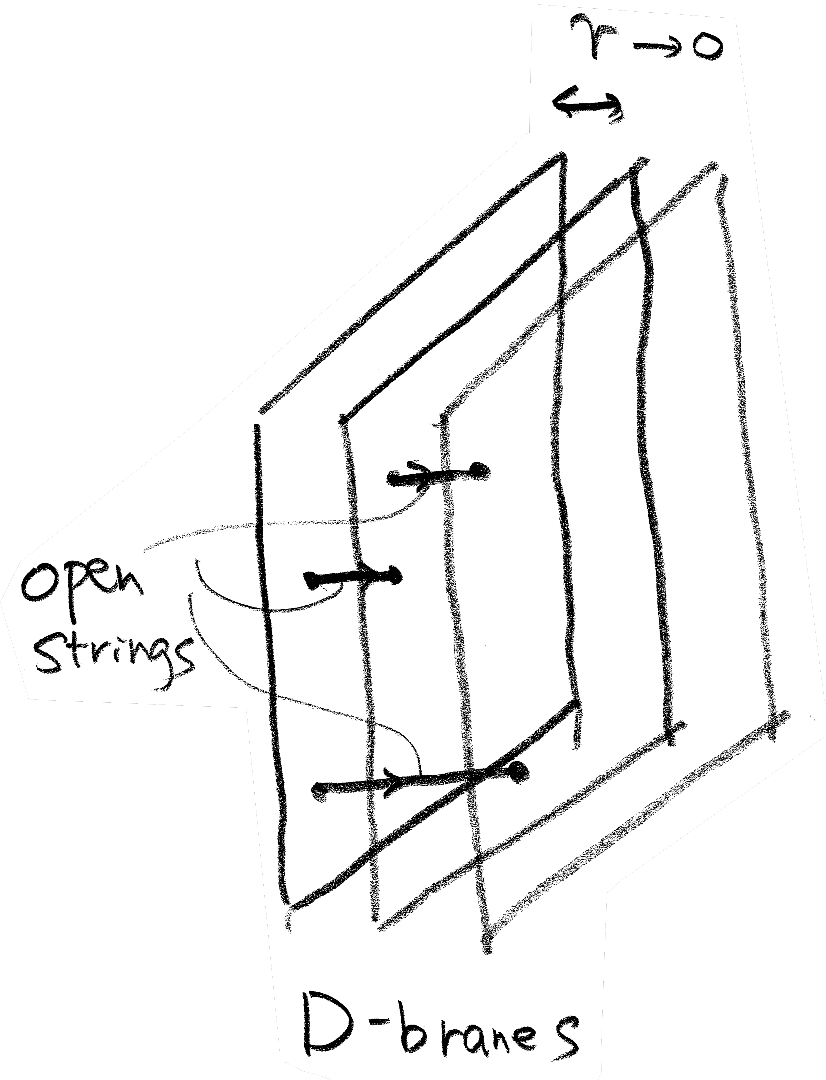


- Our idea is to consider
  tensionless strings as
  fundamental DOF of D=6 N=(2,0) CFT.

- Of course having something as excitations does not mean that something is the fundamental DOF. But this is at least a natural idea.

- In case of D-branes, this idea does work.

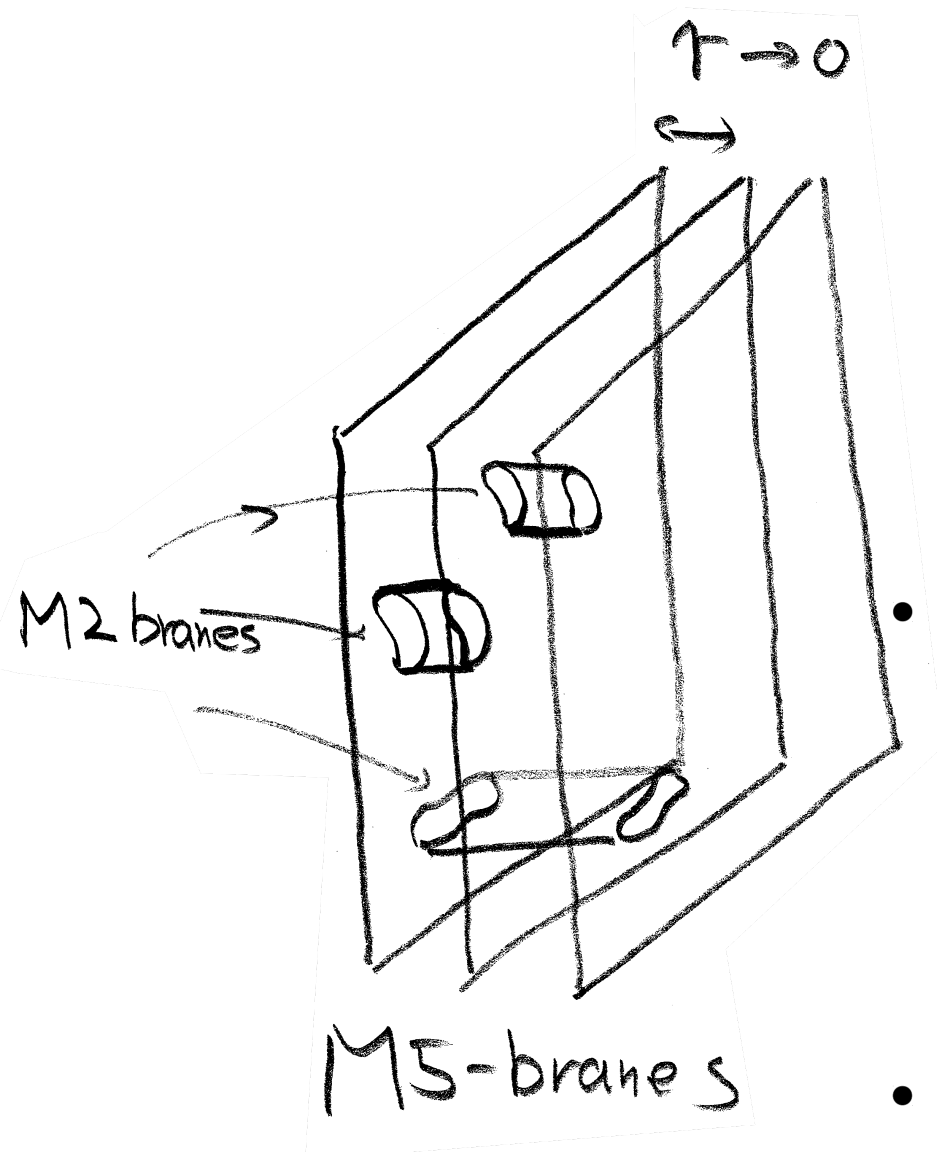
- D-branes and YM



- NxN species of massless fields from open strings connecting between i-th and j-th D-branes (i=1, ..., N; j=1,..., N)
  massless particles
  =open strings stretching
  between D-branes

- The fields has a natural rep. as NxN matrices.
- The theory turns out to be Super-Yang-Mills(SYM) theory with U(N) gauge symmetry.

- **Our proposal**



- NxN species of tensionless string fields from M2-branes connecting between i-th and j-th M5-branes (i=1, ..., N; j=1,..., N)
  tensionless strings =M2 branes stretching between M5-branes
- Closed string fields would be NxN matrix-valued.

$$\phi^i{}_j[x(\sigma)]$$ for M2 between i-th and j-th M5

- We would find a theory with U(N) symmetry = D=6 (2,0) CFT

- Why string field theory(SFT) ?
- 2nd qtz form. may be suitable for the tensionless case.

$$-m\int ds \xrightarrow{m=0} ?$$

$$\int \phi(\Box - m^2)\phi dx \xrightarrow{m=0} \int \phi\Box\phi dx$$

Our strategy is to formulate the tensionless case right away;NOT to take tensionless limit of the tensile case
cf. YM theory and mass

- Usual String theory
  $\longrightarrow$ 1st quantised formulation = rules to compute S-matrix
  construct SFT which recovers the rule

- However, we are now trying to define a CFT.
  The good observables in CFT should be something like local correlators. S-matrix can be singular and it may be tricky to define it.

- Hence, it may make sense to break the usual order of logic and start with SFT. (cf. YM theory)

- Why string field theory(SFT) ?
- We
  - -use 2nd quantised form. rather than 1st quantise form.
  - -consider the tensionless case directly.
    do NOT take the tensionless limit of the tensile case.

- Analogy to YM theory:
  - -YM theory is considered in 2nd quantised form.
  - -It is dangerous to consider massive vector theory
    and take the massless limit to define YM theory.
- Nature of observables:
  - -We are now trying to define a CFT.
    The good observables in CFT should be something like local correlators. S-matrix will be singular and it may be tricky to define it.
  - -conventional 1st quantised form. of tensile string theory
    is aimed for computation of S-matrix.

- Use of lightcone(LC) gauge SFT

- In LC gauge, one can focus solely on the physical DOF, neglecting unphysical DOF

- The theory (action) of tensile LC superstring field theory is fixed up to cubic order by the super-Poincare algebra Green-Schwarz-Brink '83

- There is a LC superspace formulation of D=4 N=4 SYM Mandelstam, Brink-Lindgren-Nilsson '83
- Free superpaticle with D=6 N=(2,0) SUSY can be formulated with a similar LC superspace (Ananth-Brink-Ramond; unpublished)

Properties of the LC formulation

- We introduce the LC coordinates,

$$x^+ = \frac{1}{\sqrt{2}}(x^0 + x^5), \quad x^- = \frac{1}{\sqrt{2}}(x^0 - x^5), \quad x^\alpha \quad (\alpha = 1,2,3,4)$$

x^+ plays the role of the time.

- Charges of super-Poincare alg. are divided into dynamical

$$P^-, \; Q_{D\dot{a}A}, \; M^{-\alpha}.$$

and kinematical ones

$$P^+, \; Q_{KaA}, \; P_\alpha, \cdots$$

A=1,2,3,4: R-symmetry index
$a, \dot{a}$ =1,2:little group SO(4) spinor index

- Dynamical symmetry transform fields non-linearly, kinematical ones linearly. E. g.

$$Q_D = Q_D^{(0)} + Q_D^{(1)} + \dots$$

$$= (\cdots)\phi\phi + (\cdots)\phi\phi\phi + \dots$$

$$Q_K = (\cdots)\phi\phi.$$

- Properties of the LC formulation

- Considering the super Poincare algebra

$$\{Q_D, Q_D\} \sim P^-, \quad \{Q_K, Q_K\} \sim P^+, \quad \{Q_K, Q_D\} \sim P_\alpha, \ldots$$

etc order by order, e.g.

$$\{Q_D^{(1)}, Q_D^{(0)}\} \sim P^{-(1)}, \quad \{Q_K, Q_D^{(1)}\} = 0, \ldots$$

gives strong constraints on the theory.

- For example
  - type IIB Superstring field theory to cubic order
    - Green-Schwarz, Green-Schwarz-Brink '83 '84
  - Complete D=4 N=4 SYM LC superfield formulation fixed
    - (incl. Jacobi identities of the structure const.)
    - Ananth-Brink-Kim-Ramond '05

- <u>Comparison to other theories in LC superspace</u>

- Our aim is to construct something “in between” the D=4 N=4 SYM and type IIB tensile super-SFT.

	mass or tension	# of supercharge	DOF
$D=4, \mathcal{N}=4$ SYM	$=0$	16	”particle”, matrix valued $\phi^i{}_j(x,\theta)$
$D=10$ IIB super-SFT	$\neq 0$	32	”string”, not matrix valued $\phi[x(\sigma),\theta(\sigma)]$
$D=6, \mathcal{N}=(2,0)$ tensionless super-SFT	$=0$	16	”string”, matrix valued $\phi^i{}_j[x(\sigma),\theta(\sigma)]$

Summary of part 1.

- tensionless strings arise from M2 between M5
- We propose to formulate D=6 N=(2,0) CFT as SFT(string field theory) for tensionless strings with matrix-valued string field
- analogous to YM theory for D-branes
- lightcone gauge seems to be appropriate

2. LC SFT for the tensionless case

-String Field

-Free part

-Cubic interaction

Free part of tensionless SFT

- The string field is

$$\phi^I_{P+}[x^\alpha(\sigma), \theta^{aA}(\sigma)]$$

$\alpha = 1, \ldots, 4(\text{trans. vector});$
$A = 1, \ldots, 4(\text{USp}(4) \text{ R-symm.});$
$a, \dot{a} = 1, 2 : \text{SO}(4) \text{ spinor index};$
$I : \text{“Lie alg.” index}$

- Chirality condition $d_{1A}(\sigma)\phi = 0$

where

$$d_{aA}(\sigma) = \frac{\delta}{\delta\theta^{aA}(\sigma)} + \frac{p^+}{\sqrt{2}}\theta^{bB}(\sigma)\epsilon_{ba}C_{BA}$$

$$q_{aA}(\sigma) = \frac{\delta}{\delta\theta^{aA}(\sigma)} - \frac{p^+}{\sqrt{2}}\theta^{bB}(\sigma)\epsilon_{ba}C_{BA}$$

- We constructed free part of the charges and verified the superalgebras (classically or at the Poisson bracket level)

$$[Q_{KaA}, \phi] = \left(-\int q_{aA}(\sigma)d\sigma\right)\phi$$

$$[Q_{D\dot{a}A}, \phi] = \left(-\int \frac{1}{\sqrt{2}}q_{bA}(\sigma)\frac{1}{p^+}\epsilon^{bc}p^\alpha(\sigma)\sigma^\alpha{}_{c\dot{a}}d\sigma\right)\phi$$

$$[M^{\alpha\beta}, \phi] = \left(-\int x^\alpha(\sigma)p^\beta(\sigma) - x^\beta(\sigma)p^\alpha(\sigma) - i\frac{\sqrt{2}}{8}\frac{1}{p^+}\sigma^{\alpha\beta a}{}_c\epsilon^{cb}C^{-1AB}q_{aA}(\sigma)q_{bB}(\sigma)d\sigma\right)\phi$$

- Physics of tensionless string
- The Hamiltonian (in 1st quantised form) is

$$P^- = \int \frac{(p^\alpha(\sigma))^2}{2p^+} d\sigma + \int \frac{T^2 (\partial_\sigma x^\alpha(\sigma))^2}{2p^+} d\sigma$$

- an usual string = a collection of harmonic oscillators

  a tensionless string = a collection of free particles

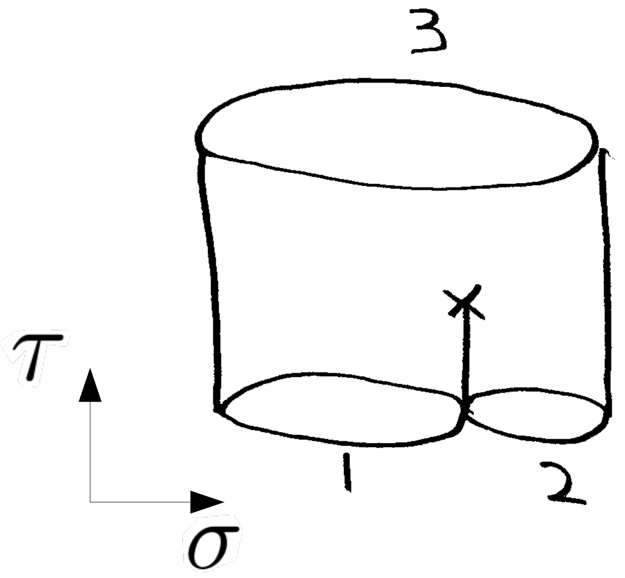
  Has to deal with the continuous spectrum.

- Each part of the tensionless string moves freely = string bits
- Information of σ -coordinates is retained by x^- defined by

$$\partial_\sigma x^- = \frac{1}{p^+} x^\alpha \partial_\sigma p_\alpha$$

and through this, the level matching condition and $M^{-\alpha}$.

Cubic interaction part of tensionless SFT



"Length" of 1,2,3 strings

$$\propto P_1^+,\ P_2^+,\ P_3^+$$

Cubic part of charges in LC SFT consists of 2 ingredients

$$(\text{insertions}) \times (\text{overlap})$$ (Green-Schwarz-Brink '83)

where

(overlap)= δ-functional connecting 3rd to 1st, 2nd strings

(insertion)=local insertion at the interaction pt

We defined the overlap and insertion for the tensionless case as well.

- <u>Cubic interaction part of tensionless SFT</u>
- Our ansatz is e.g.

$$Q^{(1)}_{D\dot{a}A} \sim f^I{}_{JK} \int \prod_{r=1}^{3} \mathcal{D}x_r dP_r^+ \mathcal{D}\theta_r \mathcal{D}\bar{\theta}_r \times \overline{\phi_{P_3^+}{}^I}[x_3,\theta_3,\bar{\theta}_3]\phi_{P_1^+}{}^J[x_1,\theta_1,\bar{\theta}_1]\phi_{P_2^+}{}^K[x_2,\theta_2,\bar{\theta}_2]$$
$$\times \left(p^+\right)^{-2}\left(P_1^+\right)^{\lambda_1}\left(P_2^+\right)^{\lambda_2}\left(P_3^+\right)^{\lambda_3}\delta(P_1^+ + P_2^+ - P_3^+)$$
$$\times \underbrace{p_\alpha \cdot w\sigma^{\alpha b}{}_{\dot{a}} d_{bA}\cdot w}_{\text{insertion}}\ \underbrace{V\left[x_1,\theta_1,\bar{\theta}_1;x_2,\theta_2,\bar{\theta}_2;x_3,\theta_3,\bar{\theta}_3\right]}_{\text{overlap}}$$

- Consistency with the SUSY algebra strongly restricts the form of the ansatz.
- Closure of algebra and power-counting yields

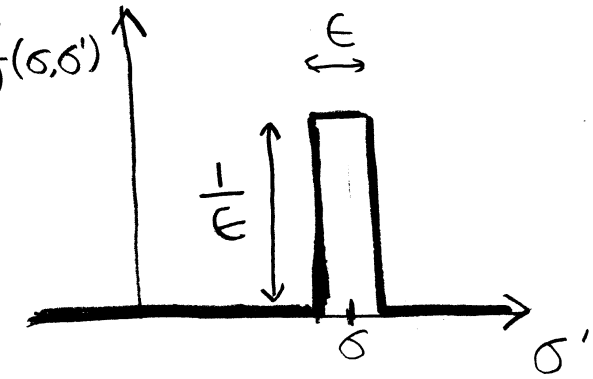
$$\lambda_1+\lambda_2+\lambda_3=\frac{1}{2}$$

The ansatz is fixed up to 2 parameters

- Verified the algebra except for those involving $M^{-\alpha}$

$\lambda_1, \lambda_2, \lambda_3$ will be fixed if we study full superalgebra.

Technical tools: Smearing and test functional



- 1. Multiplication of operators at the same σ

→

→ We use smearing

$$p(\sigma) \longrightarrow \int f(\sigma,\sigma')p(\sigma')d\sigma'$$

- 2. Evaluation of complicated expression with delta-functional and delta-functions can be difficult

→ We sandwich the expression by test functionals

$$\phi[x(\sigma)] = e^{-\frac{\alpha}{4}p^+\int x(\sigma)^2 d\sigma} \times e^{i\int k(\sigma)x(\sigma)d\sigma}$$

(generalised wave packets;natural for tensionless strings)

- Computation of sandwiching done by Wick contraction (cf.Brownian motion;analogous to matrix elements by 2DCFT in tensile string theory.)

- By using these method one can fix ambiguities in the insertion at the interaction point.

Summary of part 2.

- We constructed free part of SFT

- Cubic interaction part is partially fixed up to two parameters from part of the super-Poincare algebra

- We introduced technical tools (smearing and test functionals) to perform computation in unambiguous manner.

3. Tensionless SFT and infamous difficulties in the Lagrangian description.

- Power counting
- Reduction to D=4 N=4 SYM

- <u>Power counting</u>

- In usual field theory the dimension of coupling const. depends on the spacetime dimensions D.

  It is difficult to write (supersymmetric) action with dimensionless coupling in D=6 in usual field theory.

- <u>Power counting</u>

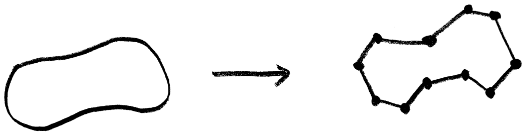
- In usual field theory the dimension of coupling const. depends on the spacetime dimensions D.

  It is difficult to write (supersymmetric) action with dimensionless coupling in D=6 in usual field theory.

- In SFT dimension of coupling const. does NOT depend on the spacetime dimension D.

- Use of SFT instead of usual field theory changes the power-counting in the favourable direction.

- <u>Power counting</u>
- For SFT powercounting changes in a favourable direction.
- Use string bits regularisation. Omit Fermions and consider arbitrary spacetime dimensions.



$$\phi_{P+}[x^\alpha(\sigma)] \to \phi_{P+}(x_1^\alpha, \ldots, x_N^\alpha)$$

- Using the form of a part of the quadratic part of the action

$$S \sim \int \cdots \int d^{D-2}x_1 \cdots d^{D-2}x_N dP^+ dx^+ \left(\overline{\phi_{P+}}(x) \sum_{n=1}^{N} \left(\frac{\partial}{\partial x_n^\alpha} \right)^2 \phi_{P+}(x) \right)$$

we find

$$(\text{dim. of } \phi) = N\frac{(D-2)}{2} - 1$$

Power counting

Now consider the cubic part of the action

$$S \sim g \int \cdots \int d^{D-2}x_1 \cdots d^{D-2}x_{N_3} dP_1^+ dP_2^+ dP_3^+ dx^+ \delta(P_1^+ + P_2^+ - P_3^+)$$

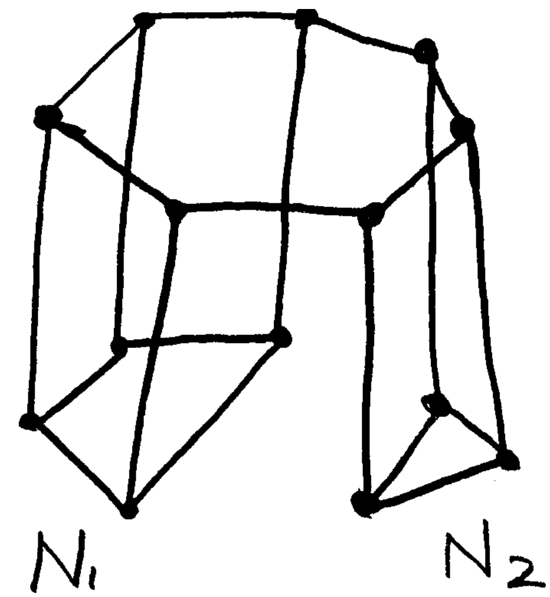
$$(\cdots)\overline{\phi_{P_3^+}}(x_1, \ldots, x_{N_3})\phi_{P_1^+}(x_1, \ldots, x_{N_1})\phi_{P_2^+}(x_{N_1+1}, \ldots, x_{N_1+N_2})$$

using $(\text{dim. of } \phi) = N\frac{(D-2)}{2} - 1$ we find

$$(\text{dim. of } g) = (D-2)N_3 - (D-2)\left(\frac{N_1}{2} + \frac{N_2}{2} + \frac{N_3}{2}\right) + 2 - (\text{dim. of } (\cdots))$$

$$= \text{does not depend on } D$$

Due to $N_3 = N_1 + N_2$



Dimension of coupling const in SFT does not depends on the spacetime dimension. (cf. usual QFT)

- <u>Power counting</u>

- Dimension of coupling const in SFT does not depends on the spacetime dimension. (cf. usual QFT)

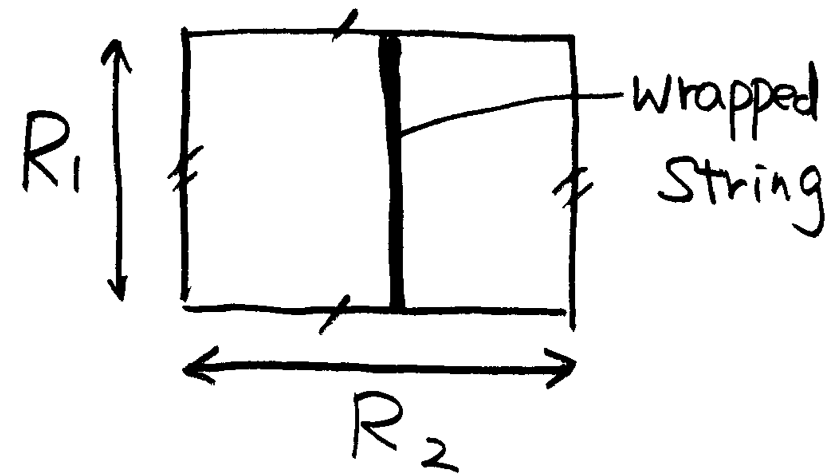
- Follows from the fact that string interaction is locally a free propagation. (The cubic and the quadratic part of the action have the same structure dimension-wise.)

- This might have been expected: it is well known that the string coupling const. (in usual string theory)
  is dimensionless.

- <u>Reduction to D=4 N=4 SYM</u>
- D=6 N=(2,0) CFT reduces to D=4 N=4 SYM

$$\frac{1}{g_{YM}^2} \sim \frac{R_2}{R_1}$$

- Dep. on R_2 can be understood from simple KK red. In usual QFT deducing dep. on R_1 is hard. Even asymmetry between R_1 and R_2 is puzzling.
- In tensionless SFT one can define the reduction of the theory using wrapped string.



which introduces natural distinction between R_1, R_2.

Summary of 3.

- Power-counting changes in the favourable direction. Dimension of coupling const. of SFT does not depends on spacetime dimesions.

- The asymmetry of dependence of coupling const. to two compactification radii can be attributed to the direction of the wrapping of tensionless strings.

4. Problem of Observables

- "What are the observables of tensionless SFT?"
- AdS7/CFT6 & large J approx. gives hint.
- a speculative idea: BMN-like operators on a loop space

- <u>Problem of Observables</u>

- Our formulation contains lots of light DOF. Will they cause any singularities?

- Do tensionless strings really contain non-trivial dynamics?

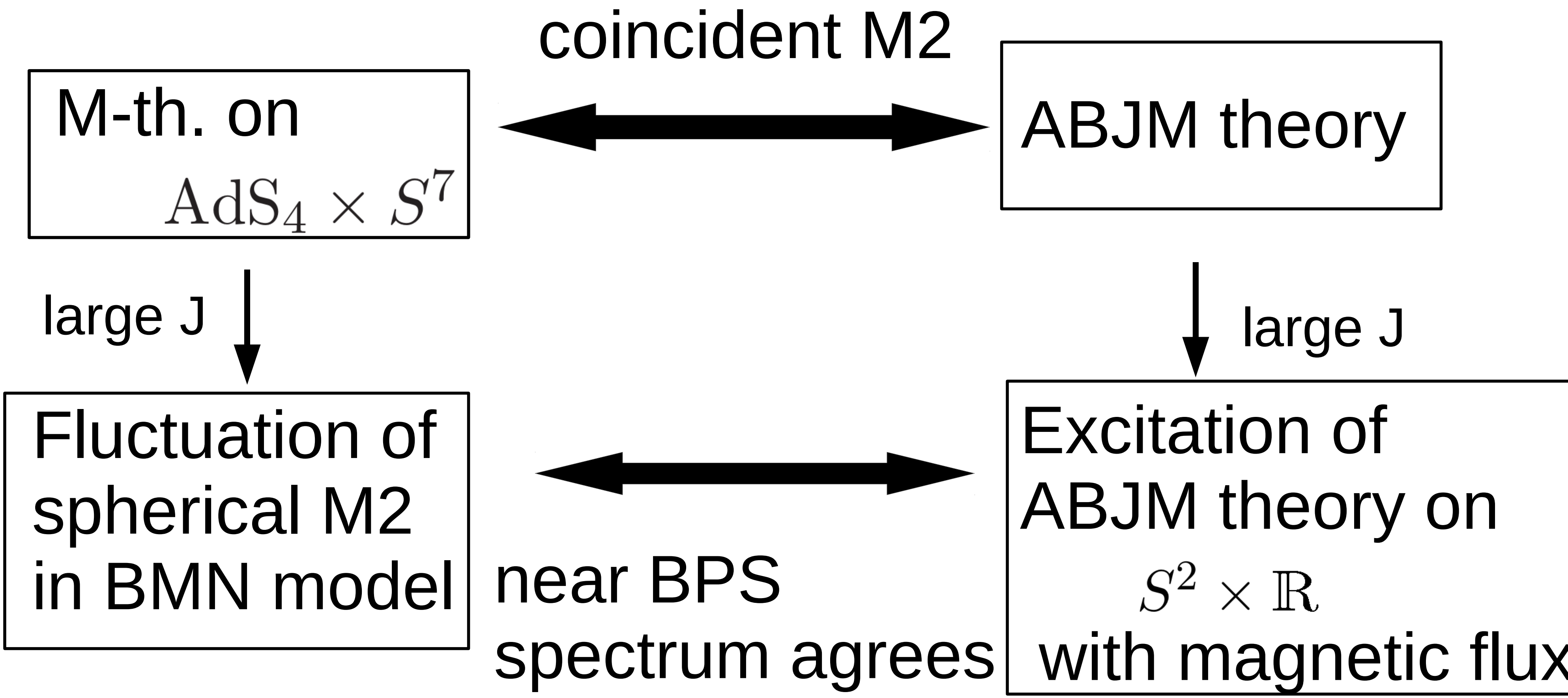
- To address these questions, we first need to know what are good observables of tensionless SFT.

- This is probably the most important open problem in our approach at present.

- It is possible that while our theory uses very many DOF for Lagrangian formulation, there is a vast redundancy: The we identify correct observables in our model, the spectrum of these observables may be consistent with traditional point of view of local CFT.

Hint from AdS7/CFT6

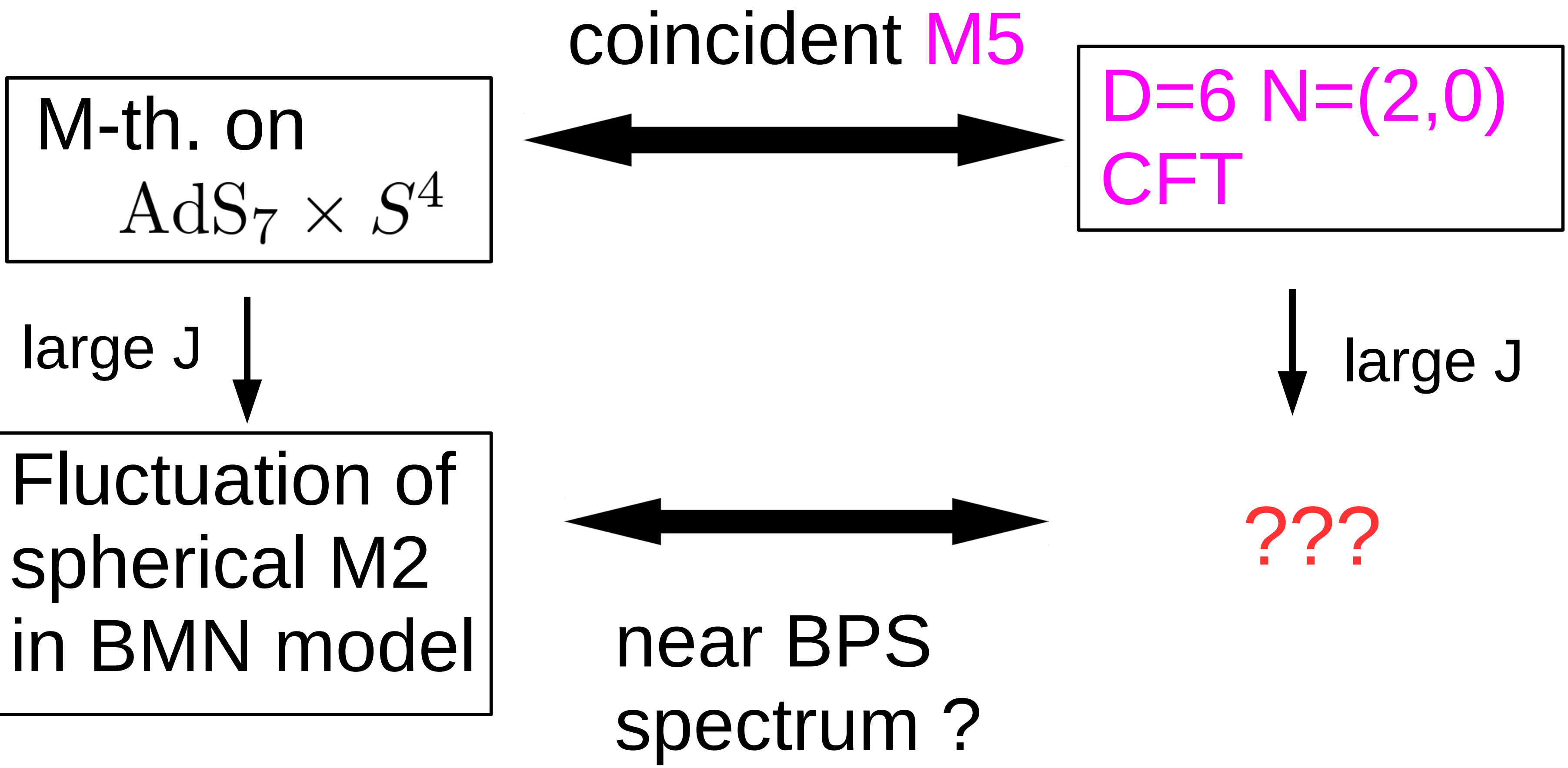
- Large J (R-charge) sector of AdS4/CFT3 Kovacs-Sato-HS'13



- “Can we do this for AdS7/CFT6?”

Hint from AdS7/CFT6

- Large J (R-charge) sector of AdS7/CFT6?



- Large J sector of D=6 N=(2,0) CFT should contain near-BPS operators corresponding to fluctuation of spherical M2.
An important hint for any attempt to formulate D=6 (2,0) CFT.

- operators corr. to fluct. of spherical M2?: a speculation

- For D=6 N=(2,0) CFT, the radial quantisation (which worked for D=3 ABJM theory) do not work.

- In AdS5/CFT4, Berenstein-Maldacena-Nastase'02

$$\mathrm{Tr} Z(x)Z(x)Z(x)X(x)Z(x)Z(x)Z(x)X(x)Z(x)Z(x)$$

where $Z(x)$, $X(x)$ are matrix local fields of D=4, N=4 SYM, are the near-BPS operators corresponding to closed strings. The order of matrix products gives σ -coordinates.

- We need one more σ -coordinate for M2. Something like

$$\mathrm{Tr} Z[x(\sigma)]Z[x(\sigma)]Z[x(\sigma)]X[x(\sigma)]Z[x(\sigma)]Z[x(\sigma)]Z[x(\sigma)]X[x(\sigma)]Z[x(\sigma)]Z[x(\sigma)]$$

in terms of matrix-valued field on a loop space corr. to tensionless string in D=6 N=(2,0) CFT ?

- This speculation lead us to study tensionless SFT.

Summary of 4.

- The important question is

  "What are the observables of tensionless SFT?"

- AdS7/CFT6 & large J approx. gives a hint.

  D=6 (2,0) CFT in the R-charge sector should contain an operator corr. to. fluctuation of spherical M2

- A speculation:

  BMN-like operator on a loop space

Summary and discussion

Summary

1. We propose to construct LC gauge SFT of tensionless strings as a Lagrangian formulation of D=6 N=(2,0) CFT.
2. Tensionless SFT is constrained by SUSY
   - Free part is constructed
   - Ingredients of the cubic vertex: overlap and insertions for tensionless case are constructed.
   - Ansatz for cubic part is given partially fixed by part of SUSY algebra
3. Tensionless SFT may circumvent infamous difficulties
   - Power counting
     string coupling const. is dimensionless
   - Reduction to D=4 N=4 SYM
     incorporates distinction between two compactification radii via wrapped string.
4. Crucial to understand observables of tensionless SFT
   - should contain near-BPS op. corresponding to fluct of spherical M2
   - BMN like op. on loop space?

Discussions

-It is possible that tensionless SFT may eventually be superceded by some kind of regularised (string-bits or matrix-model) description. Then the role of tensionless SFT is not a fundamental description but an effective theory for a class of light DOF(tensionless strings).

-By introducing VEV corresponding to the transverse distance of M5-branes, off-diagonal string fields should become tensile ~analogous to the Higgs effect of YM for D-branes. Should determine the yet undetermined parameters.

-If the tensionless SFT approach turns out to work, it would extend the realm of both what we usually think of as string theory and CFT.

-Our construction is not complete yet. But we believe that we introduced necessary tools so that tensionless SFT is now becoming something in which one can do concrete calculations to check whether the theory really works.